approach

NAVAL AVIATION SAFETY REVIEW

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TECHNOLOGY & SCIENCE

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...weapons systems and their components.

They test aircraft for usefulness and SAFETY.

Prior to 1941, the task of testing and evaluating naval aircraft was scattered among five naval stations. But with war already raging in Europe, the United States had begun to rearm as fast as possible. Early in 1941 then, the Navy Department directed the Bureau of Aeronautics (now NavAirSysCom) to improve and expand its facilities for developing better and safer aircraft.

Ultimately, a centralized naval aircraft test organization was established which went into full operation in early 1943 at the new airfield at the Naval Air Station, Patuxent River, Maryland. In 1945, the name was altered slightly to its present title of Naval Air Test Center (NATC).

NATC has continually kept pace with the race into the supersonic in order to provide naval aviation with the best possible aircraft to safely accomplish its many missions.

Continued next page

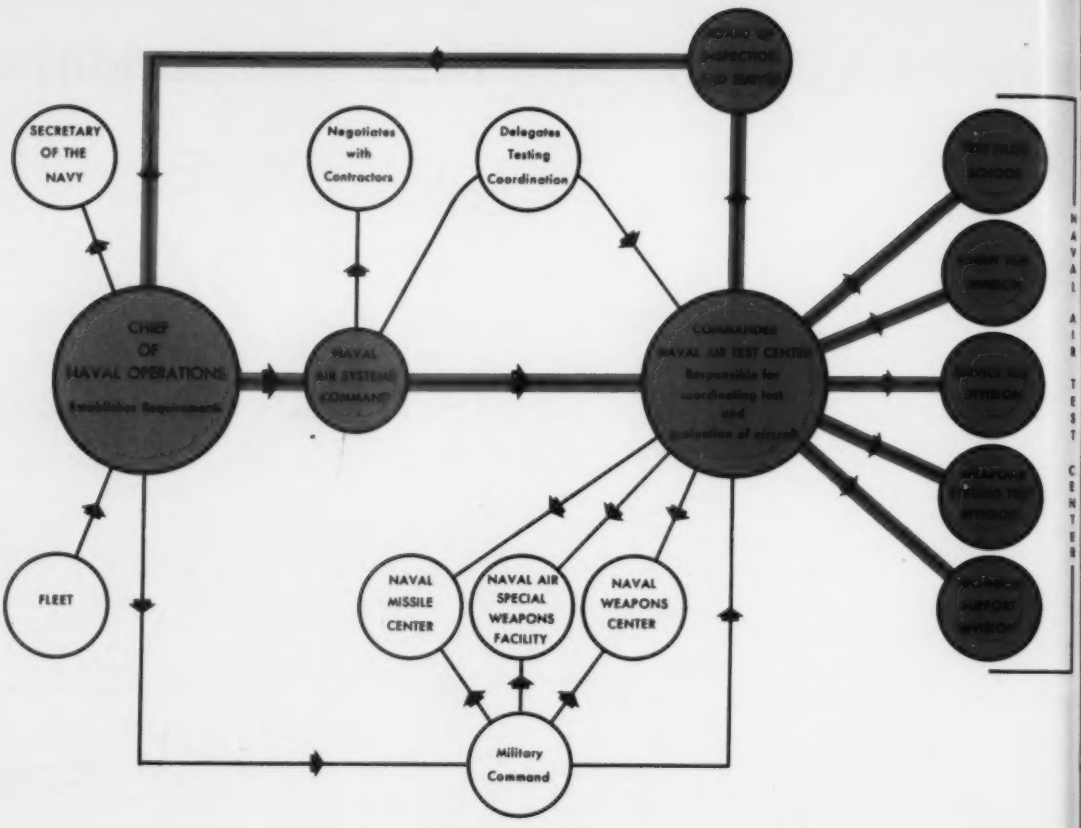


FIGURE 1

Figure 1 graphically outlines the chain of command above and within NATC. Basically the Test Center consists of five major divisions: (1) Test Pilot School; (2) Flight Test; (3) Service Test; (4) Weapons System Test; and (5) Technical Support.

An activity which operates in conjunction with the Test Center is the Board of Inspection and Survey (BIS). This organization is considerably older than the Naval Air Test Center. It was created in 1882 by an act of Congress, ". . . to inspect ships going to and from sea." This was perhaps the first step taken to insure that the U. S. Navy had the best of fighting equipment. Since World War I the Board has expanded its activities to include trials of new aircraft. It also makes the decision to declare older aircraft no longer safe for use.

The Commander of the Naval Air Test Center has additional duties as a technical advisor to the Board of Inspection and Survey which, in turn, reports to the Secretary of the Navy through the Chief of Naval Operations.

Since World War II, the increased sophistication of aircraft has necessitated similar growth in new aircraft testing and evaluation. Figure 2 graphically illustrates the present system.

As soon as a manufacturer is awarded a contract to build a new naval aircraft, the Test Center makes contact with the selected company. By the time the first prototype is ready for flight, Test Center personnel have begun their evaluation on a parallel course with the manufacturer.

Not many years past, it was felt that time could be saved and faster prototype improvement could be achieved by conducting a Navy Preliminary Evaluation (NPE) simultaneous with the contractor's demonstrations.

While the contractor conducts his preliminary tests, Navy pilots fly the model in a planned series of tests designed to match the aircraft's performance with the original requirements and specifications. This work is not, in any sense, acceptance tests. The intent is to identify specific problems and potential problem areas very early in the development so that they can be corrected before final production tooling

begins. The pilots comment only on the machine which they have actually flown. It is not their responsibility to identify ways to correct the problems, this is left to the manufacturer as part of his contract. As a result of his own tests and those made by the Navy, the contractor modifies the aircraft. Mass production then commences.

The third phase in the growth cycle of a new aircraft is the Board of Inspection and Survey trials. At this stage, all of the divisions of the Naval Air Test Center check production models to see if the contract specifications have been met. No aircraft goes through the Board's tests with a perfect score. If, however, the deficiencies can be circumvented by restrictive instructions and the model is still considered safe and useful, it is put into fleet operational use. Additional tests are then scheduled to correct whatever deficiencies remain.

The above listed series of tasks are accomplished by a coordinated effort of four of the five Test Center Divisions. The one exception to this effort is the Test Pilot School which makes an indirect contribution by producing pilots to conduct future programs. To further clarify each division's part in the program, let's discuss the inner workings of each division.

Flight Test Division

The Flight Test Division of the Test Center conducts trials to test and evaluate both experimental and service type aircraft, and general aeronautical equipment and materials as directed by the Naval Air Systems Command. Pilots attached to Flight Test go aloft to check for flying qualities and performance characteristics. Some aircraft presently in the system are the A-6A and the F-111B.

Project test pilots put the aircraft through an exhaustive series of tests to insure that nothing will be left to chance when the aircraft are ready for delivery to the operating squadrons. Then, even after fleet delivery, certain tests are continued to correct known deficiencies and to perfect newly conceived improvements or missions.

To be sure that a new model meets the Navy's rigid military specifications for performance and safety, pilots test fly the machines under varying

TIME SPAN THE GROWTH CYCLE OF A NEW AIRCRAFT

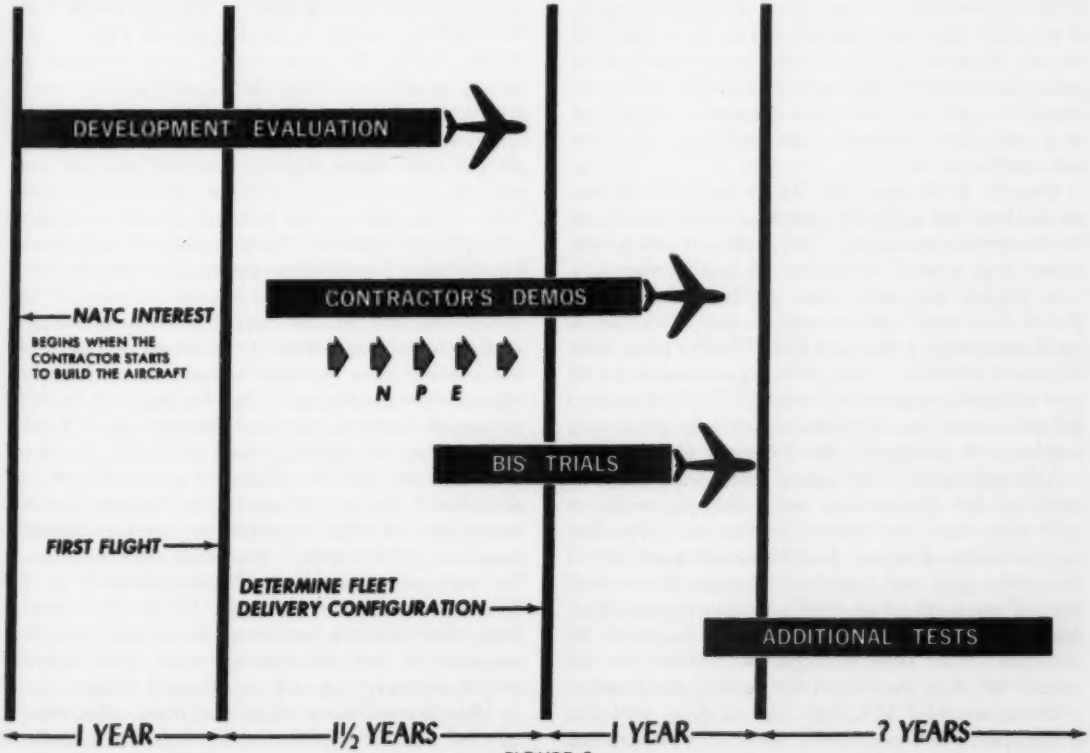


FIGURE 2

weather conditions and with different configurations.

Another important task of the Flight Test Division is to ascertain the capabilities of the aircraft for carrier operations. This testing, performed by the carrier suitability branch, covers every facet of operations with catapults and arresting gear. The enviable safety record of carrier based aircraft attests to the value of the work.

Some Examples of Flight Test Work

One important test which pilots of the Flight Test Division must make concerns spin recovery techniques. The end product, hopefully, is to find ways and means by which every naval aircraft can be recovered safely from a stall/spin condition. Unfortunately, through the years, no such successful technique could be worked out for some models.

As an example, during the early stages of World War II, a new fighter aircraft was sorely needed to out-perform the Japanese *Zero*. Initially the *Corsair* seemed to be the answer. During the course of the BIS trials, however, it was determined that the airplane could not meet the requirements for spin recovery. In essence, once it was in a spin, it could not be recovered. Several test pilots lost their lives in the futile effort. In peacetime, the contract probably would have been cancelled, but the urgency of the war dictated that the *Corsair* must, somehow be used. Consequently, the aircraft was put into mass production and all pilots were cautioned, "*Don't get in a spin! But if you do—bail out.*" And the *Zero* was conquered.

After the War, one of the Navy's early jet fighters, the *Cutlass*, had a similar problem; it too, could not be recovered from a spin. This deficiency along with some others caused its contract to be cancelled.

In the last few years other jet fighters have displayed some odd spin characteristics. With not a small amount of work (and risk) NATC pilots have developed satisfactory spin recovery techniques which were ultimately entered in the NATOPS flight manual for each model aircraft. But one aircraft with a spin problem still unsolved is the *Phantom II*.

Although early wind tunnel tests with a model indicated that the airplane had a flat spin mode, no such spins were encountered by the contractor during the demonstrations. Additional investigations of its stall, spin and recovery characteristics were deemed necessary so an F-4B was specially modified. Along with its other instrumentation a special 30′ anti-spin chute was included in addition to the normal 16′ drag chute used for landing deceleration.

On its second NATC flight, the airplane went into a flat spin which was finally broken by deployment of the large anti-spin chute after the normal aerodynamic controls and drag chute had proved ineffective.

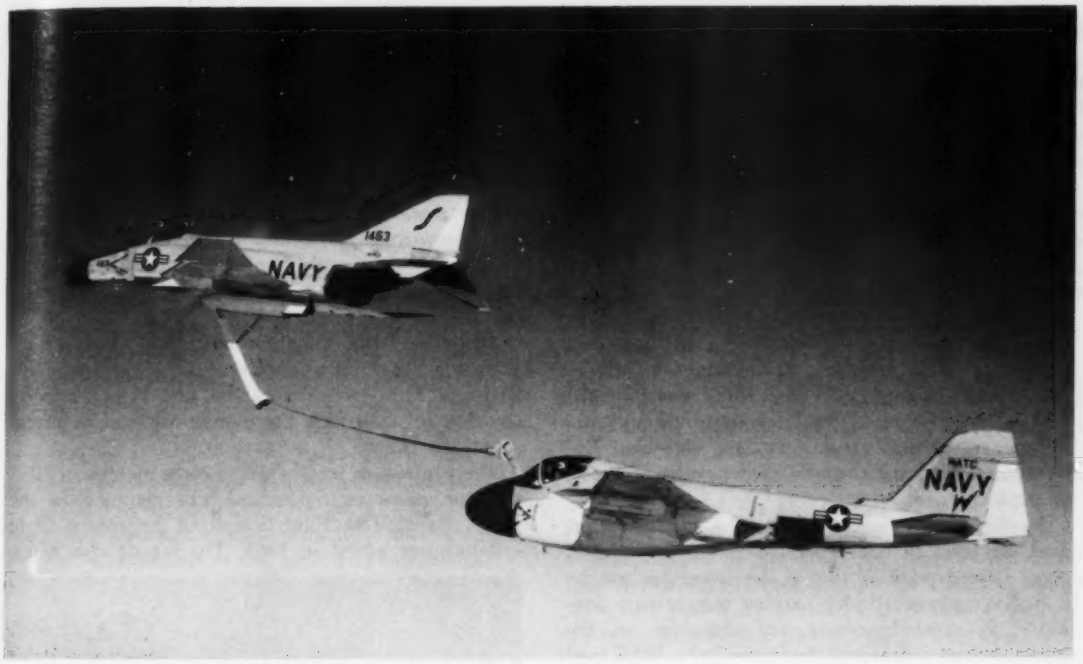
After several more modifications were made to improve the deployment and jettison characteristics of the anti-spin chute, testing was resumed. The recoveries from 33 more spins were uneventful. The next test flight, however, was an experience.

After takeoff, radio communications were established and checked with the spin airplane, the A-4E chase airplane, and the telemetry ground station. Passing 10,000′, the pilot performed normal phasing maneuvers for instrumentation correlation purposes and after passing FL300 he completed the pre-spin check list, calling off each item. The accuracy and completeness of the check list was verified at the time by the chase pilot and the project engineer monitoring the flight in the telemetry ground station.

The first intended maneuver was to be a normal erect right spin utilizing right pro-spin controls for two turns followed by a recovery using full anti-spin controls. The chase pilot took up a position 2000′ below, ½ mile astern, and displaced slightly to the right in order to observe the maneuver. The F-4 pilot turned on his recording devices, retarded both engines to idle, and slowed the airplane to the stall. The airplane stalled in level flight at FL440, 150 KCAS, 39,740 lbs gross weight, with a center of gravity position at 33.0% MAC. As the *Phantom II* stalled the pilot applied full right pro-spin controls (right rudder, aft stick, left aileron). The airplane pitched nose down slightly and oscillated in yaw and roll, but did not enter the desired right spin. After 17 seconds in this post-stall gyration the pilot attempted to terminate the maneuver by neutralizing the controls. The airplane yawed left and entered a left spin.

Realizing that he had entered a left spin, the pilot applied full anti-spin controls (right rudder, aft stick, left aileron). The recovery controls were ineffective. After almost three turns, a steady-state, left flat spin developed. Since he was in a flat spin, the F-4 pilot deployed the normal drag chute at FL310. The chase pilot reported that the chute had streamed and had not inflated. The project engineer on the ground, recognizing the flat spin characteristics on the telemetry readouts, recommended immediate deployment of the emergency spin chute. It was deployed as the *Phantom* passed down through FL280. The normal drag chute did not jettison automatically as it was supposed to, and although the spin chute was observed to deploy, it did not blossom either.

After several more turns the chase pilot recommended to the F-4 pilot that he cycle his controls to possibly induce oscillations which might aid in



Aerial refueling experiments.

recovery and, perhaps, change the airflow characteristics in the wake to aid in opening the spin chute. Recovery could not be effected so after 24 turns the pilot ejected at about 10,000′ utilizing the alternate ejection handle. He parachuted to earth unharmed, but the aircraft was a total loss.

The Problem Must Be Re-studied

Since previous spin tests have been successful with the *Phantom II* there is every reason to believe that a spin recovery technique can be worked out for the flat-spin mode. Before the next series of tests, however, a more satisfactory spin-drag chute system will be perfected so that, hopefully, additional aircraft will not be lost. The spin-drag chute emergency recovery system has been in common use for many years and it does work if it can be inflated. So—the job is not finished in Flight Test. Meanwhile, F-4 drivers are continually reminded to know every word about spins in their F-4 NATOPS flight manual.

Service Test Division

The Service Test Division conducts accelerated field service trials of all new aircraft and equipment to evaluate their service suitability and maintenance requirements. It accomplishes this by attempting to wear out a new airplane. In so doing, valuable information pertaining to man-hour maintenance requirements and spare part usage is acquired.

At Service Test pilots conduct combat tactics simulating fleet operations in order that a more realistic evaluation of the overall operational capability of the aircraft may be obtained. Airplanes are flown constantly, day and night, and meticulous records of maintenance time and parts reliability are kept. In this manner it is possible to find out in a six-month period what would normally take a service tour in a squadron to establish. This phase of testing gives a good indication of how a plane will perform under wartime conditions. The A-7A has recently been put through this wringer.

Service Test evaluates aircraft instruments as well as various other items of equipment peculiar to the aircraft being tested while the machine is undergoing its trials. Also during this period, maintenance methods and procedures are formulated and recommended.

The Aero-Medical Branch attached to Service Test is the unit established to study the field of human engineering from the pilot's viewpoint. Items such as pilot fatigue and pilot comfort in new equipment are studied by Navy flight surgeons.

The division maintains and operates a jet repair shop and jet engine test cell for its own use as well as for the other divisions. This branch concentrates on performing tests on turbine engines and associated

equipment.

An additional function of Service Test includes a specially designed fleet indoctrination program to familiarize flight crews and maintenance personnel with new types of production aircraft when they first take delivery. The fleet personnel are temporarily attached to NATC where they go through an extensive FAM program and operate the equipment at an accelerated rate to accumulate about 600 hours of flight time under the guidance of Service Test experts.

Weapons Systems Test Division

The Weapons Systems Test Division is the newest and largest of the trio of test divisions aboard the station. Commissioned on 31 May 1960, it was formed through the merger of two former divisions; the Armament Test and Electronics Test divisions. The merger increased the Center's efficiency by eliminating duplication of effort.

The division is responsible for the fire power of naval aircraft. It tests every item of fire power, except guided missiles, that is developed for use by U. S. Navy planes. Under varying temperature conditions, in specially constructed chambers on the ground, and at different altitudes in flight, WST men test-fire these weapons. Guns, mines, bombs, rockets, and associated equipment, all are tested minutely for accuracy and reliability.

Also of concern to the Weapons Systems Test Division are the electronic installations that activate radio, radar, fire control, navigation and instrument flight aids in high-speed aircraft. The division tests entire electronic and electrical systems and parts of systems to determine their suitability and value for operational use in specific types of Navy planes. In a shielded hangar which excludes all outside electrical interference (the largest of its kind in the world) much of this testing takes place.

Large aircraft, (mostly C-121s and P-3s) equipped as flying laboratories and manned by WST crews are in the air almost constantly over land and sea, in clear and stormy weather while their crews operate and test new, experimental electronic equipment. These planes, considered to be the finest flying laboratories of their type in existence, have been invaluable in furnishing data on safe all-weather flying that otherwise could not have been obtained on the ground.

Test Pilot School

Obviously the work involved in testing the increased performance required of complex modern military aircraft is not entrusted to fledgling aviators. Specialized flight testing techniques require a high degree of skill and operational experience. From volunteer pilots nominated by fleet aviation commands come the naval aviators who are trained at the Test Pilot School.

The school was deemed necessary in late 1944 when the Test Center had reached the peak of its expansion under the load of wartime contracts. Fleet pilots highly trained in operations, tactics, and maintenance were found to know little about the specialized methods of flight testing which were needed to compile data on performance, stability and control, handling qualities and fuel consumption.

Early in 1945, an informal Flight Test Pilot's Training Program was started in the Flight Test Division. This evolved into the Test Pilot Training Division in 1948 with the inauguration of a formal six-month course of instruction.

The course was lengthened to eight months in 1958 and the name of the school was changed to the U. S. Naval Test Pilot School. A helicopter flight syllabus was added in 1961. The school also trains small numbers of pilots from other services as well as foreign nationals.

An A-7 undergoing trials at NATC.

The course is about evenly divided into two phases; academic and flying. Half of each working day is spent in the classroom studying aerodynamics, aircraft and engine performance, and other related aeronautical engineering subjects. The remainder of the day is devoted to the flight phase. This includes planning and then flying test flights in a variety of fleet (and a few other model) aircraft. A detailed engineering report must be written on every syllabus test flight.

Upon graduation, most of the pilots go to assignments which take advantage of their newly acquired skills. Practically all pilots attached to NATC today

are graduates of TPS.

Technical Support Division

Technical Support is somewhat different than the other divisions in that, as its name implies, it supports the work of the others and does not conduct its own individual projects. In essence, this division provides all the systems needed to obtain and record data from flight and laboratory tests.

In the course of its work, the division must keep up with all advances in the state-of-the-art of data measurement and recording techniques. Such a responsibility requires continuous research and development programs.

When requested by the other divisions, Technical Support plans, designs, fabricates, installs and services data systems for all test work. This instrumentation includes oscillographic, photopanel, magnetic tape and telemetric data gathering installations.

To support its mission, Technical Support maintains and operates a data reduction installation, a theodolite/radar range, a photographic laboratory and a model shop.

A Test Involving All Divisions

One of the many flight test programs conducted at NATC is concerned with developing safety of flight envelopes for dispensing ordnance. In the course of the program a minor accident occurred which could have become a major operational problem if it had not been explored at NATC. The solution to this problem involves all divisions.

The purpose of the flight was to perform additional separation tests on the Mk77 Mod 3 Fire Bomb on the A-4E. Five bomb-racks were loaded with the selected stores. The intervalometer was set for ripple-pair mode at an interval of 100 milliseconds.

Preflight and other inspections were satisfactory. Immediately after takeoff, the pilot switched to the range control frequency and gave the desired release parameters to range control: dive roll-in altitude—16,000′, release altitude—8000′, and dive angle—50 degrees. The sky condition was VFR, 10,000′ scattered in the range area.

After reaching 16,000′ the pilot was vectored to a raft target 1½ miles offshore east of the weapons test area. Range control called roll-in for a dummy run which was made with all armament switches off. Immediately after his recovery the pilot was vectored to another roll-in point for the live run. Just prior to push over, the pilot activated the master arm switch and cycled the fuel dump switch to aid theodolite tracking. Range control called push over for a live run at which time the pilot entered a dive with the airplane's nose pointed at the target. Range control gave the verbal signal to release at an altitude of 8000′.

The pilot hit the pickle and store separation occurred in the proper sequence at the desired interval of 100 milliseconds. The outboard stores on stations 1 and 5 separated, followed by the stores on stations 2 and 4. The center store did not drop because the pilot released the bomb pickle before the bomb had time to separate even though the pickle was held down for 130 milliseconds.

All bombs pitched nose upward after release. The fire bomb on aircraft station 5 hit its parent rack and ruptured. The store on station 2 struck the lower surface of the port wing just outboard of the wheel well about 200 milliseconds after the bomb pickle was initially depressed. The bomb detonated and ruptured on contact with the wing. This caused a fuel flash fire in the port wheel well which charred and blistered all exposed surfaces in the well. The lower surface of the port wing was punctured and the landing gear fairing was bent and distorted.

The pilot felt the airplane "jolt" but did not know that it had been struck by one of the fire bombs since such pulses are normal with ordnance releases. He initiated a normal pullout; then range control informed him that he was streaming fuel and had possibly been struck by a fire bomb. The pilot cycled the fuel dump switch as this was a possible source of the fuel. The ruptured wet wing, however, was the sole source of the streaming fuel. The pilot wasted no time in returning to base where he made a precautionary and safe landing. The NATC system and test pilot training saved another airplane.

Subsequent inspection of the airplane revealed multiple punctures in the lower wing just outboard of the wheel well, and charred paint in the well which was due to the flash fuel fire. After studying the problem again, the testing will continue until an acceptable and workable dispensing envelope can be declared safe for fleet operations.

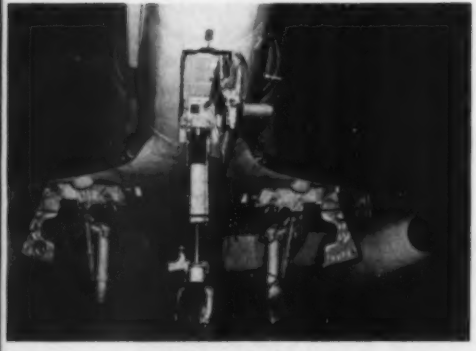
In the course of a lifetime, humans never stop learning and improving their total usefulness. Likewise, most naval aircraft have varying degrees of growth potential. Accordingly, in the course of their operational lives, the aircraft undergo modifications. These alterations are made for various reasons; engine improvements, airframe improvements, new and different weapons systems, new or change of mission employments, etc. Each modification requires a new Naval Air Test Center evaluation to insure the safety and usefulness of the change.

So—, time marches on and the Naval Air Test Center continues to carry out its mission, "To conduct tests and evaluation of aircraft weapons systems and their components." ◄

Short Snorts

An accident usually wins a race with time.

An etched ramp . . .



. . . and no wheels.

Another Ramp Strike

AT the conclusion of a routine night close air support mission, an A-4C pilot commenced a CCA. Everything was normal until the final portion of the approach when the pilot went low in the groove. The LSO called for power while advising the pilot of his unsatisfactory position. The result was overcontrolling causing the *Skyhawk* to be high at the ramp. The pass ended with a bolter.

The next pass was high on the glide slope at one half mile and off-center. Corrections were attempted resulting in a high rate of descent close to the ship. The LSO radioed, "A little power" and then a frantic "Power!" The nose wheel cleared the ramp but the MLG sheared when they struck the rounddown. The impact point was 12′ to the left of the centerline. The aircraft continued up the deck and the severed right strut bounced up puncturing the wing. The hook caught number 1 crossdeck pendant and brought the A-4C to a halt on the nose wheel, main mount stubs and drop tanks. The airplane caught fire but it was quickly brought under control and the pilot stepped out uninjured.

The primary cause of this accident was improper pilot technique in controlling the aircraft on the glide slope. Although military power was added prior to impact, the nose-low attitude was maintained until an *instant* before impact. The fact that the pilot did not recall seeing the *red* ball indicates that he was *spotting* the deck rather than the lens during the crucial phase of the approach. A secondary cause was fatigue and slight apprehension motivating him to overcontrol and neglect the lenses.

Nose Gear Trouble

The wheels were extended in the specific NATOPS sequence for the landing approach. Immediately the RA-5C pilot noticed a barber pole, unsafe condition on the nose gear while the main mounts indicated down-and-locked. Also, the light remained ON in the gear handle and there were no lights in the angle-of-attack approach indexer. NATOPS emergency instructions were followed with no improvement in the unsafe indication. A low pass was made over a ground observer who assured the pilot that the nose wheel appeared to be down-and-locked.

A touch-and-go was made safely but the nose gear still showed barber poles. More touch-and-go experimentation was planned but a recheck of the fuel state dictated a final landing. The hydraulic subsystem switch was set to the take-off-and-land position and the final

Faulty installation caused this *Vigilante* trouble.

approach was commenced with 50 degrees of flap and droop. After touchdown on the main mounts the nose wheel was eased on to the runway while pitch control was still responsive. Roll distance was then about 1700′ and all seemed well. After another 1000′ of roll, however, the nose wheel began to slowly fold forward (normal retraction course). In another 500′, the *Vigilante* was stopped after a short skid on the nose.

Later investigation revealed that the nose gear lock-down pin was jammed in the unlocked position due to inaccurate installation alignment.

Snails Place

A recent report cites a potential FOD threat to jets operating from Mediterranean area runways. Snail control efforts at Rota, Spain include some good down-to-earth advice. Just in case you are experiencing similar difficulties, we pass it on.

Runway area grass and weeds are kept closely trimmed in order to provide the least habitable area for the pests.

In the vicinity of runway lights a weed killer (Sterilit) is used for weed control, and rock salt is placed on the concrete bases of the runway lights to provide an additional barrier to snails crawling onto these elevated structures.

Engine Bleed-Air Malfunction

TWO F-4Bs were engaged in combat tactics at 12,000′. The wingman was indicating 450 kts with throttles at MRT. Suddenly, an explosion was heard and simultaneously, both throttles jumped back in the pilot's hand to the near idle position. Quickly thereafter, cockpit pressurization was lost. The pilot suspected that the rear seat cockpit canopy had blown off but a check with the NFO revealed all was intact.

Further checks in the pilot's cockpit detected that the right external fuel light had illuminated on the telepanel. This directed the pilot's attention to a rapidly decreasing fuel quantity gage. Illumination of the port engine fire warning light followed. The port engine was secured. Then the utility hydraulic pressure was noted to be ZERO.

The section leader was informed of trouble so he joined up on the wingman for inspection purposes. A single-engine return to base seemed to be feasible and enroute the pilot was further notified of a visible fuel leak.

The ailing *Phantom II* was directed to engage the emergency arresting gear on the field. The landing was accomplished in a routine manner without damage.

Subsequent investigation revealed that the bleed air duct to the port engine failed causing minor explosions which, in turn, damaged hydraulic and pneumatic lines as well as electric wiring.

This and similar incidents have motivated plans for improvements to prevent such failures to the F-4 engine bleed/air boundary layer control systems.

Bleed-air ducts do fail.

Gun Blast

An A-4E pilot completed a gunnery mission and returned to base with the aircraft in an UP condition. Postflight inspection, however, revealed that the starboard 20mm cannon had a shattered blast deflector. The pieces had made numerous dents and scratches on the fuselage along with several small punctures. All of this was unknown to the pilot in flight.

On the particular mission, the pilot had fired only six rounds and the belt was a mixture of HEI and API. Since the firing was concluded for reasons other than gun malfunction, any one of the six rounds could have caused the damage. The exact cause of the trouble is undetermined but there is strong suspicion that the HEI was defective.

Since its commissioning in May 1960, VT-1 has taught the fundamentals of flying to over 17,000 students. To commemorate this milestone APPROACH presents an instructor's spoof of this outstanding achievement.

Another Wilbur is Born

Ask a primary flight instructor about his work and chances are you will see a very pained expression followed by the words, "It's a million laughs." The multitude of impossible, improbable and unbelievable events that shape Old Dad's working day with the fledgling aviator places him on an emotional roller coaster which rapidly transitions him from a summit of satisfaction to the depths of frustration.

Coping with the "new breed" is not an easy task. We do, however, know something about our opponent that helps us to stabilize our emotions into a simple, on call, Jekyll and Hyde personality.

Introduction—The average flight student has had at least one psychology course during his tour at Finsterwald U before joining up. This he will put into practical application in the moment he meets you. It may be safely said that the ensuing stern but friendly initial instructor brief will be taken as a "get to know you talk" and, therefore, he disregards it.

Briefings—Succeeding hop briefs become quite short and informal as the instructor sips his coffee and asks, "Are there any questions?" Naturally the "diamond in the rough" can't ask a question because he doesn't understand any part of the new life he leads. Anyway with so many distractions at Trader's or out at the Beach, how can he really think?

First Flight—At the outset he does not understand a word Old Dad says to him while airborne. He simply reacts to a certain volume and tone from the intercom. While nodding his understanding of the shoulder harness, he proceeds to shut the fuel off, etc. The flight does not begin, as far as the student is concerned, until the instructor states, "You have the airplane." After the ritual of acknowledgement *the aircraft has him.*

The Syllabus—The instructor has 11 flights (approximately 15 hours) in which to prepare his charge for that all important (safe for solo) flight check. Eleven flights may seem more than adequate. However, when on the 10th flight one is still endeavoring to explain that airspeed is required for flight, and that it is preferable to land on runways, the instructor wonders where he went wrong. . . "But, sir, you didn't tell me *not* to land on taxiways."

Der Tag!—The student's approach to the crisis of the safe for solo check finds him in one of two general categories, (1) red hot, and (2) super humble. The red hot student veritably drips with "Roger, Wilco, Over and Out." Emanating self-confidence at every turn, even when he tangles his silk scarf in his parachute harness and pratfalls off the wing, he does it with poise.

A student who uses approach number two could melt the coldest, hardest heart with a glance. His Bassett-like expression is beyond description. Not even Scrooge himself could refuse this lad an up.

Pre-Flight—He is going to impress you one way

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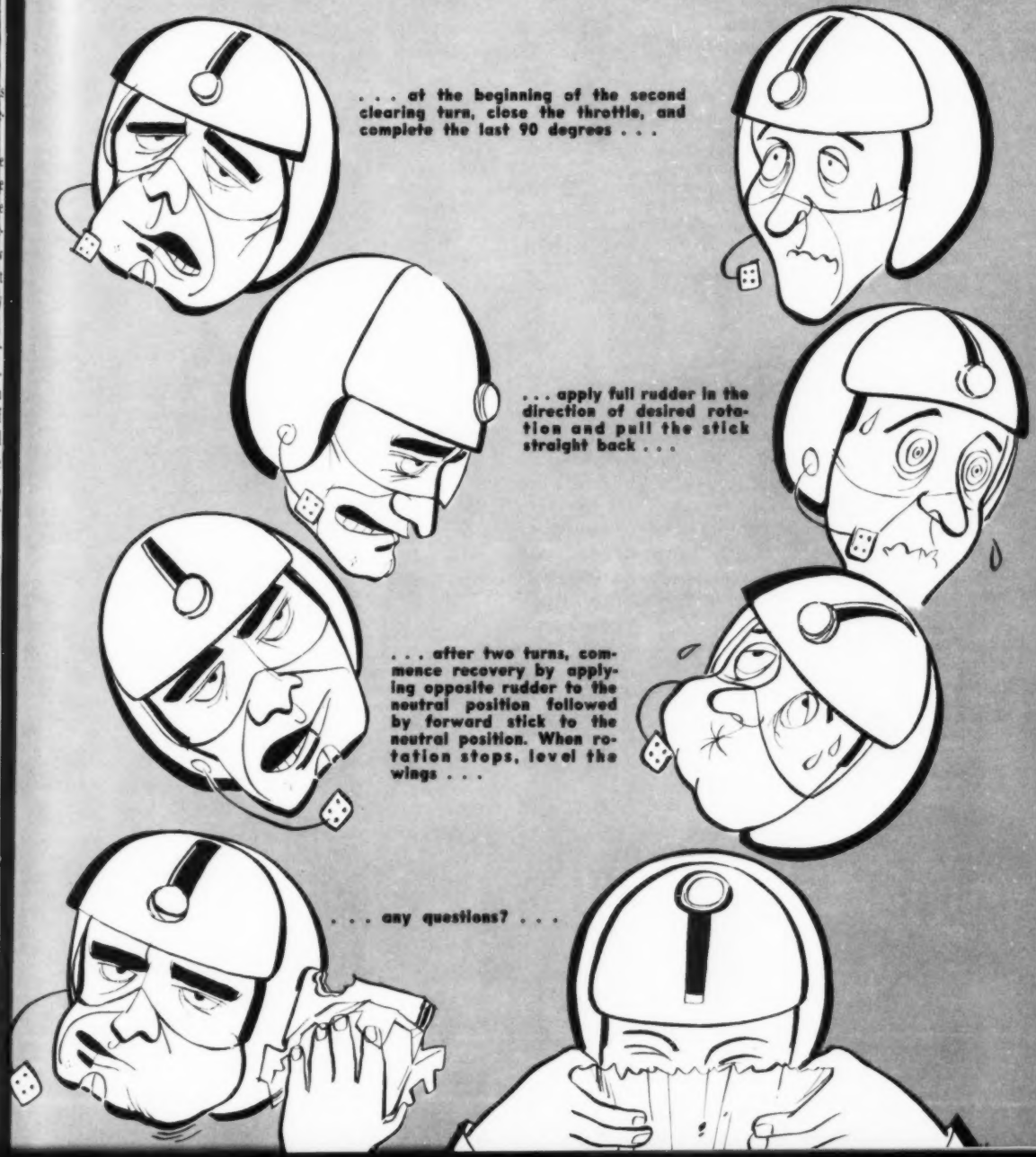
Introduction to the Precision SPIN

As seen by

the Instructor... and the Student



or another. Either he will locate a microscopic crack in the landing light or point blindly into the engine and remark that the sliplatch on the perloken valve is seeping oil.

The Check—Once settled in the cockpit the student is an ace personified. His voice reports are loud and clear (even with the interphone dead from lack of electrical power). Finally after a number of procedural difficulties, such as raising the gear handle on the magneto check, we are airborne and heading toward the training area.

The flight is an average, almost two-hour, thrill after thrill experience in which the student, clever, cunning and ruthless individual that he is, succeeds in getting you to vacate the rear cockpit to watch his debut from the sidelines.

First Solo—He successfully completes three controlled crashes at the "Silverhill Solo Circus" and taxies over to pick up the check instructor, never noticing the instructor's expression of relief for, (1) having avoided serious aircraft damage, a (2) remembering to taxi over and pick up the ba seat occupant for transportation back to Sauf It would be painful to have to bum a ride back ho

Upon return to home field the student is co pletely incoherent. A debrief is useless. The st dent is on cloud nine (on airspeed and altitude His retention rate on corrective comments is p haps 10 percent, maybe. Oh well, there are wards. There's a glimmer of hope for him, and all part of the program.

The Solo 13—Usually called the kamikaze fligh this one is really *his* hop. He signs for the plan preflights it, and charges out to the area all by hi self. A review of omni procedures is *most* importa because he must be able to find Saufley Field on h return.

After he manages to hunt and pray his way bac he is so thankful that he is completely unaware one or more flight violations (he cheerfully agrees atone for these in a poster of his own design to submitted to the friendly safety officer).

Then, when he realizes he has soloed, he becom a member of the upper crust, the top ten percent the young American males—and the sharpest, sa iest nasal radiator that ever put his foot throu a wing flap.

And you know, he could be, in fact he might another Wilbur. After all, wasn't he trained by t best?

Story by:
LT R. E. HALLUM
LT R. C. JOHNSON
CAPT B. M. BABITZ, USMC
Cartoons by:
LT G. N. PUNCHES

VT-1

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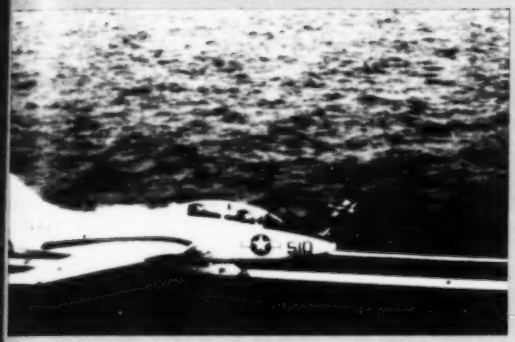
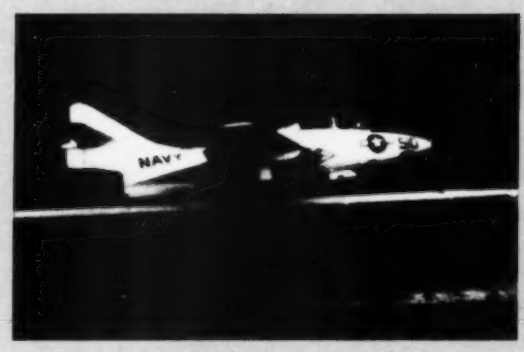
OVER and OUT



Neglecting lineup, aircraft moved left . . .



. . . dropped into port catwalk.

A flight of seven students briefed to fly solo in TF-9Js out to the carrier for initial qualifications. Takeoff, rendezvous, enroute, and carrier breakup proceeded normally.

Student Doaker made two uneventful touch-and-go landings followed by a fouled-deck waveoff. On the fourth pass, his aircraft touched down well to the left of the angledeck centerline (about 10′), moving right to left, and engaged No. 4 crossdeck pendant. Rollout continued to the left with the port main mount dropping into the catwalk. At this point the aircraft came to a stop just forward of the fresnel lens. Although forward motion had been checked, the aircraft slowly eased over the side in a sideslipping manner. It then rolled inverted and continued to stretch out the No. 4 pendant while hanging suspended by its tailhook.

During its slide over the side, the engine was observed to be running at full power. When movement on the No. 4 pendant ceased, the nose section was submerged up to the cockpit. The pilot secured the engine, blew the canopy, manually unstrapped himself and stepped into the sea. His pickup by helicopter was almost casual.

This accident was caused by improper pilot technique in correcting for a right-of-centerline lineup on a normal day carrier landing approach. A right-to-left drift developed and was further aggravated by the pilot making a last minute correction to the left. Moreover, the pilot seemed to be oblivious to good lineup, later attributed to overconcentration on the meatball.

Suspension by crossdeck pendant . . .

. . . allowed pilot to step into sea.

FCLP to Carquals

Field Carrier Landing Practice (FCLP) in the Navy is the first step in orienting qualified pilots toward safe and successful shipboard landings.

Since all pilots first learn to fly from land runways, there must be a transition phase before operational carrier landings. The major effort consists of many landings and takeoffs on a runway marked to simulate a carrier deck. Complete simulation is impossible because the land does not pitch and roll, and the terrain under the pattern has obstacles, as opposed to the flat sea. The type of obstacles will vary with different airports and necessitate specifically designed FCLP patterns for each locale. Several hours of VFR day FCLP are always conducted before VFR night FCLP is scheduled. This should make obstacles and their location crystal clear to all pilots, but in spite of extensive precautions and supervision all too many pilots are flying into the surface and/or its protrusions, in the FCLP or carqual pattern.

Field carrier landing practice is defined by the LSO NATOPS as ". . . that phase of required flight training which precedes carrier landing operations. It must simulate, as nearly as practicable, the conditions encountered during carrier landing operations, including the various configurations of aircraft."

To illustrate problems, some accidents/incidents are narrated.

Tree damage to the A-3B

Clipping the Treetops

An experienced naval aviator was flying an A-3B on scheduled VFR night FCLP. Although relatively flat, the terrain under the pattern was heavily forested with treetops reaching up to about 545′. Minimum altitude on the downwind was set at 800′ and 650′ at the 45 deg. position.

On his first pass, the pilot was waved off because the LSO considered him to be heavy at the ramp. The next pass was on altitude and speed but slightly wide at the 180. He aggravated this by going deep before turning off the base. Approaching the 45, the pilot observed lights on the runway, and he shallowed the angle of bank to about 15 deg. correcting for lineup. Shortly thereafter the radar altimeter light, which was set at 300′, illuminated. Simultaneously the outline of a few trees against the airport twilight became visible ahead of the aircraft. Immediately the pilot increased power to 100 percent while leveling the wings. A second later he felt a thud similar to a bomb released from an Aero 7A rack. Another long instant passed before the power took hold and a climb was commenced without further obstacle impedance. While executing a safe waveoff, flashlight checks revealed a rip in the leading edge of the starboard wing close to the wing-fold crease. Flight controls were normal while circling the field so an uneventful landing was accomplished.

It is considered that the field in question was far from ideal for night FCLP. Consequently, adherence to minimums and a precise pattern was imperative. The combination of being slightly deep in the pattern and a little low at the 45 deg. position almost put this pilot in the accident file instead of the incident drawer.

Dragging Along Over Water

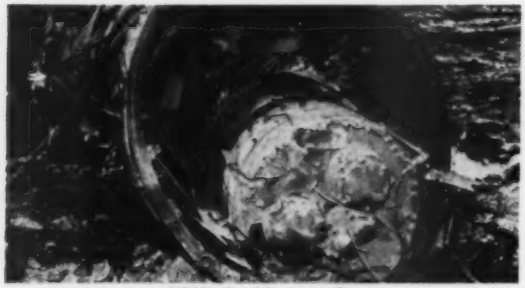
Two pilots were conducting VFR night FCLP in an S-2E. The pattern led over a bay adjoining the field so terrain obstacles were not present. One pilot made eight successful bounces and then he switched seats with the other aviator.

The new pilot had completed seven touch-and-goes and when turning onto the downwind for the eighth, the tower cleared an arriving aircraft into the pattern for a wide approach to land after the *Tracker*. This probably distracted the FCLP pilot because he went

Watch the gages when low and slow at night.

slightly deep on the downwind. Then when the LSO first observed the *Stoof* it was deep and low coming into the 45. The attitude seemed good but the altitude was not so the LSO transmitted, "You're low, wave off ! ! !" three times in quick succession. Before the LSO had finished his last warning call, he observed the S-2E pitch up and roll to the left. A moment later the aircraft snap-rolled into the water.

Since both pilots perished, the exact cause of the accident will never be known. Witness observations seem to indicate that the aircraft got too low and slow and encountered a stall/spin. Disorientation might have been a factor but it was a VFR night and many land lights were visible. Since the accident occurred on the sixteenth pass, complacency intermingled with fatigue is suspected along with distraction because of the appearance of transient traffic.



FCLP should not end . . .

Insufficient Power

The pilot of a *Crusader* blasted off from his home land base for a period of night FCLP at a Naval Air Facility some 85 miles away. The departure was IFR because of a low cloud layer over the home base. The bounce drill location, however, was clear with 15 miles of visibility. No difficulty was experienced enroute and 30 miles out the destination's tower was successfully contacted. Closer in, the tower directed the pilot to switch to paddles frequency for the beginning of the briefed heavy passes. There was no joy with paddles so the pilot went back to the tower and got a break clearance with the instructions to try paddles again on the downwind.

The RF-8A broke at 3000′ indicating 200 kts. Power was reduced from 84 to 82 percent and the speed brakes were extended while rolling into about 60 deg. of bank to the left. After 90 deg. of turn, the pilot lowered the gear when decelerating and shallowed his bank to 30 deg. After a glance at the field, the pilot turned his eyes back to the instruments and noted 170 kts turning into the 90. A moment later, the pilot increased power to 90 percent and took another look at the field lights. Several seconds later, the pilot's attention was snapped back to the instruments because the *Crusader* was felt to pitch and roll mildly. Opposite rudder was applied in a righting attempt while the angle of attack registered 22-25 units and the airspeed had mysteriously fallen off to an indicated 130 kts. The gyrations continued and when passing down through 500′ in a 60 deg. starboard bank, the alarmed pilot punched out successfully.

In spite of the fact that the pilot was uninjured, he was extremely busy during the last few seconds in the aircraft so that the exact cause of the trouble can not be pinpointed. Basically, however, it is suspected that his speeds were less than those reported and he was in a stall/spin condition, possibly because he underestimated the true power requirement.

. . . like this *Crusader*.

Possible Altimeter Error

The crew of an F-4B had fully qualified on day and night FCLP. Then a short time later the pilot day qualified aboard a carrier. That same evening the pilot took off from his home land-base for night carquals in clear weather with 10 miles of visibility.

After takeoff, the pilot checked in with the carrier and was given his marshall instructions. He commenced his approach on schedule and at 20 miles the approach controller had the *Phantom II* on his radar. At 18 miles the pilot transmitted, ". . . platform one eight" and continued descending past 5000′. He was supposed to be descending at 2000 fpm in order to be at 1000′ entering final approach. One minute later according to the ship's radar the pilot had closed to 14 miles and should have been at about 3000′ when he was heard to transmit, "(call sign) is climbing, my radar altimeter—." This was the last contact with the crew because the aircraft crashed at sea and the crew perished. Circumstantially, it appears that the plane struck the water simultaneous with the pilot's last word, ". . . altimeter—."

Rate of descent must be exactly controlled. . .

Since the first part of the message indicated that a climb was being initiated there is good reason to believe that the pilot had been descending at more than 2000 fpm and had suddenly become aware of the situation because of a warning indication from his radar altimeter.

The cause of this accident is officially classed as undetermined, but a list of safety lessons can be derived. (1) When flying low at night and/or IFR, pilots must be doubly sure of all altimeter workings and settings. (2) Rate of climb (descent) must be exactly controlled at all times. (3) Airspeed must be precisely on schedule. (4) Flight attitude must be consistently correct. If the aircraft configuration utilizes other crewmen (such as a copilot or RIO), cross checks should be continuous and mandatory.

Slipstream + Slow Airspeed = Hard Landing

The night was clear and 15 while a flight of TF-9Js circled around in the FCLP pattern. Upon completing six bounces, *Cougar* pilot X was directed by paddles to make the next one his final. Meanwhile, the tower cleared two other aircraft to land out of column GCA. The sequence was such that pilot X swung in behind the second one as the first waved off.

The tower then told pilot X ". . . roger No. 2 following one short in the groove, cleared to land . . . ." The LSO was not informed that the two GCA aircraft had been sandwiched into his FCLP pattern and when the leader waved off he was thoroughly confused. A moment later, however, the LSO observed the wingman on GCA (identity was unknown to the LSO but not the tower) being followed dangerously close by another aircraft straightening out on the final. The LSO immediately transmitted a warning intended for the second aircraft (Pilot X), "Interval." At about the same instant Pilot X encountered severe turbulence and his port wing went down almost 90 deg. The LSO transmitted for power and then said, "Take it around." Pilot X immediately rammed on 100 percent and tried to correct his attitude with rudder and back stick. Violent oscillations continued for a few more seconds until the port wing struck the runway pavement. This apparently righted the aircraft because it then hit

A wing was lost in the process.

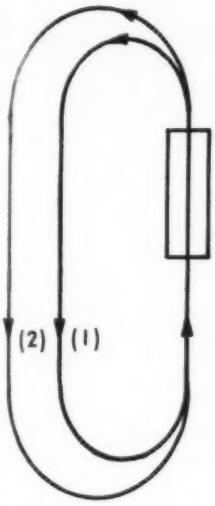
the surface fairly flat on its wheels before bouncing back into the air. About another 150′ farther on the *Cougar* hit the turf to the right of the runway shearing off its starboard main mount and wing. Everything came to a halt 650′ more, still on the turf and the pilot got out unhurt. The crash crew arrived quickly and extinguished a small residual fire

There are two official Navy documents designed specifically for safe CV landings and takeoffs: (1) NATOPS for Landing Signal Officers and; (2) NATOPS CVA/CVS. Here are some pertinent quotes.

"*Pattern*. The pattern depicted at right is standard for day and night FCLP operations. Deviations are authorized only when necessary for simulated CCA, terrain or obstruction clearance, local traffic considerations, and adverse weather. The distances and altitudes depicted are mandatory for the normal 180-deg. position at night. The turn from the 180-deg. position will be delayed so as to intercept the glide slope, wings level, at 600′.

According to NATOPS here are the Standard Transmissions for FCLP:

Transmission	Meaning	Required Response
"You're high," or, "You're a little high."	Aircraft is (slightly) above optimum glide slope.	Adjust altitude immediately.
"You're low," or "You're a little low."	Aircraft is (slightly) below optimum glide slope.	Maintain altitude until slope is intercepted.
"You're going high."	Unless corrected, aircraft will go above optimum glide slope.	Re-establish rate of descent.
"You're going low."	Unless corrected, aircraft will go below optimum glide slope.	Stop rate of descent momentarily.
"You're lined up left," or, "You're lined up right."	Aircraft has undershot/overshot centerline.	Correct lineup immediately.
"You're drifting right."	Aircraft is drifting right of centerline.	Correct lineup left to centerline.
"You're drifting left."	Aircraft is drifting left of centerline.	Correct lineup right to centerline.
"Hold your nose up."	Speed is OK, but nose position is low.	Correct attitude to optimum.
"You're fast."	Aircraft speed is excessive.	Correct airspeed/angle of attack indication.
"Little power."*	Aircraft decelerating; unless corrected, will become slow.	Correct with power.
"Power."*	Aircraft is low and/or slow.	Correct with power.



(1) VT basic track, ¾ nm abeam; jets at 450′ altitude (AGL) and props at 350′ altitude (AGL).
Prop day/night track, ¾ nm abeam at 300′ altitude (AGL).
(2) Jet day/night track, 1¼ to 1½ nm abeam, 450′ altitude (AGL).
Clearing turns in accordance with aircraft type NATOPS manuals.

The carrier landing is the end result of all field training under day and night conditions. The effectiveness of the CVA/CVS weapons system depends on the overall efficiency of carrier landing operations if peak combat readiness is to be maintained. To effectively carry out assigned missions, each aviator must be able to perform a carrier approach and landing within the standards set for this evolution.

NavAvnSafeCen statistics have tabulated 552 FCLP accidents from July 52 to July 67. For the same period there have been 571 FCLP incidents. These high rates would indicate there is room for improvement.

"You're on glidepath."	Informative.	Continue approach.
"Cut."	Release signal, as necessary, to landing.	Response mandatory for all prop landings and jet barricade engagements.
"Waveoff."	Self-explanatory.	Add full power and climb. Response mandatory.
"Bolter."	Self-explanatory.	Add full power. Response mandatory.
"Attitude."	Aircraft is flat.	Correct attitude to optimum.
"Speedbrakes."	Speedbrakes not retracted after waveoff or bolter.	Close speedbrakes. Response mandatory.
"No speedbrakes."	Informative signal	Extend speedbrakes.
"No hook."	Informative signal	Lower hook.
"No wheels."	Informative signal	Lower wheels.
"No flaps."	Informative signal	Lower flaps.

*If APC is engaged, override APC and correct manually with power.

Radio Communications During Emergency Situations—The standard radio phraseology given above will suffice for normal operations. There will be times when, due to emergency situations, the LSO must deviate from this phraseology. During such emergencies as loss of visual landing aids, reduced cockpit visibility, etc., the LSO will be required to revert to a complete *radio talk-down* type of transmission, not only to provide corrective signals, but also to provide the glide slope information."

"Los Angeles Center, this is NJ 705 broadcasting in the blind!!! Leaving 3000 for FL 180, 30 miles southeast of Navy Lemoore!!"

ON THE GLIDE SLOPE

Have you ever received an impossible clearance? This could happen to you!

"ATC clears NJ 705 to the Navy Miramar Airport via direct Bakersfield, direct El Toro, direct Laguna DME fix. Climb to and maintain 3000'. Right turn after takeoff heading 050 for radar vector to Bakersfield. Departure control frequency 318.8 squawk Mode 3 Code 2000."

Monday morning dawns gray and wet, an unusual weather pattern for Lemoore in the summertime. The scheduled TA-4F trip to Miramar will be a good opportunity to log a few hard-to-come-by actual instrument hours. It also comes as a welcome relief from instructing basic instrument hops.

The trip to the weather guesser produces a forecast of IFR conditions enroute and at destination. But Miramar should be well above minimums, with no thunderstorm activity forecast. You fill out your DD 175 requesting routing direct Bakersfield, direct El Toro, direct to the Miramar Laguna DME fix. A radar departure to Bakersfield with an enroute altitude of FL 190 should keep the boys at LA Center happy.

Preflight, post-start and taxi are a bit on the soggy side, but otherwise normal. In the runup area, clearance delivery advises that there will be a 10-minute clearance delay, due to heavy traffic in the Bakersfield sector. The increasing rain confirms your decision to leave the canopy closed, uncomfortable as it may be.

In the Lemoore RATTC "blue room," it has been a busy morning, to say the least. With the unexpected IFR weather and a number of controllers on vacation, the staff is hard pressed to keep things working smoothly. Sympathy is about the best thing that can be passed to pilots waiting for clearances since Los Angeles is saturated for the time being.

Ten minutes pass and you again call the clearance delivery controller. He advises you that an additional 15 minutes delay may be expected due to Center workload. Beads of sweat from the high cockpit humidity begin to run together on your forehead as you respond with a disgruntled "Roger."

Amidst thoughts of a cool beer, the controller finally crackles through your sweaty headset with the awaited clearance. Just as filed, with one exception; climb to and maintain 3000'. With his assurance that the altitude is only temporary and that you can expect a higher altitude on handoff to Los Angeles Center, the controller has redeemed himself considerably in your esteem.

Navy Lemoore tower clears you for takeoff and to switch to departure control 318.8, monitor Guard, prior to takeoff. The takeoff roll is normal, at 140 kts rotate and you are airborne. Gear up, flaps up, acceleration normal to 310 kts. Your call to Lemoore departure control confirms radar contact, heading 050, climbing to 3000'.

The cool air from the vents is a welcome relief in the cockpit. You settle down and mumble something to yourself about the aggravating red tape associated with IFR flying in this day and age. Why do clearance delays always occur on days when ground

Long range radar at an FAA Center.

cockpit conditions are most miserable?

Heading 050, 3000′ and 310 kts; right on the money. Not much first pilot time these days, but the old pro can still hold a steadier hand than most of the youngsters in the instrument course.

The departure controller observes the steady blip of NJ 705 as it approaches the turn point for a vector to Bakersfield.

"NJ 705, turn right heading 140, vector Bakersfield."

Silence!

You suddenly realize that the heading 050 is taking you considerably off course. Better give departure control a call!

"Lemoore departure control, this is NJ 705, over."

Silence!

"Lemoore departure control, this is NJ 705, over."

Silence!

Hmmm! The UHF worked fine right after takeoff, must be departure control's transmitter. You decide to switch to approach control frequency and make contact.

"Lemoore approach control, this is NJ 705, over."

Silence!

"Lemoore approach control, this is NJ 705, over."

Silence! Amplified.

The pattern is taking shape. You are solidly IFR, can't raise anyone, and a long way from destination. With many hours as an instrument instructor under your belt, the proper lost communication procedure is old hat as you automatically turn toward Bakersfield. No problem involved, just track direct Bakersfield, El Toro, to Laguna at last assigned ****** "Egad! 3000′! Why didn't I get a higher altitude? What do I do now?"

The proper lost comm procedure flashes to mind regarding altitude. Maintain last assigned altitude or the MEA, whichever is higher. It says so right in Sec II of the FLIP Planning Document and in the Emergency Procedures Section of the IFR Supplement; but, what is the MEA between Lemoore and Bakersfield; and between Bakersfield and El Toro?

The situation is now deteriorating rapidly. You glance at the only navigational chart in the airplane, a High Altitude Enroute Chart. The controller said to expect a higher altitude on handoff to Los Angeles Center; but what altitude and where do you climb?

Calls to Lemoore departure control, Lemoore Approach control, Bakersfield radio and on Guard channel in that order produce no response. You are closing rapidly on Bakersfield with a realization that the terrain to the southwest rises sharply to an altitude much higher than 3000′. You must climb, but to what altitude? Flight Level 180 crosses your mind, for it will certainly give adequate terrain clearance, it's in the high altitude structure; it's the MEA depicted on the enroute high altitude chart; and based on weather forecast information, it is the lowest useable flight level. If you climb to FL 180, how will center know what altitude you are maintaining?

Only one choice remaining, squawk IFF Mode 3 Code 77, broadcast in the blind on Guard channel, climb and pray!

Epilogue

An ATC clearance is, in addition to other things, an understanding between the pilot and the ATC controller about the proper routing and altitude to be flown on an IFR flight. It becomes extremely important in a lost communications situation, for it is the only method which can be used by both pilot and controller to determine the proper course of action for the flight.

The clearance as initially stated in this case was incomplete. It did not contain either a time or a fix at which the pilot could commence his climb to a specified flight level in the high altitude structure which he had requested. (Ref. Terminal Aircraft Control 7110.8—515c(3) and En Route Air Traffic Control 7110.9—340c(3).) Whenever a pilot has filed into the high altitude structure and receives an altitude assignment lower than the structure requested without an expected future clearance to an altitude within the filed structure, he should request ATC to provide an expected future clearance altitude.

The clearance delivery controller rushing to get the delayed clearance out as rapidly as possible and the pilot in his impatience to get airborne due to uncomfortable ground conditions, both overlooked the essential portion of the clearance which specifically covered the lost communication situation at low altitude.

As a result, the aircraft ended up climbing and cruising through one of the highest density IFR traffic areas in the world at an altitude unknown to ATC.

If you have any questions regarding instrument flight procedures, send them to:

Commanding Officer

VA-127

NAS Lemoore, Calif. 93245

HEADMOUSE

Have you a question? Send it to Headmouse, U. S. Naval Aviation Safety Center, Norfolk, Virginia 23511. He'll do his best to get you and other readers the answer.

F-8E Start Procedures

Dear Headmouse:

I have a few questions that deal with the starting procedures for the F-8E.

NA 01-45HHD-2-1, General Information and Servicing Instructions, gives the following procedures for:

False Start/Hung Start Above 25% rpm.

"a. Place fuel control switch in EMERG
b. Advance throttle slowly if necessary to obtain Idle RPM
c. Place Fuel Control switch in NORMAL"

NATOPS agrees, stating:

"Place switch in NORMAL when engine reaches Idle RPM." NW 02-10ADE-502, Engine Manual, concurs with NATOPS and the Servicing Manual that switching the fuel control from PRIMARY to MANUAL shall not be attempted unless 25% RPM is attained, but it states that *any start* where the emergency side of the fuel control must be used is to be considered an *abnormal start*. It states further that switching back to PRIMARY is to be performed at 45% rpm. J57 PPB 652 states: "Do not select MANUAL (emergency) fuel system to relieve a hung start or acceleration problem."

Based on the foregoing references, my questions:

a. Are we to follow PPB 652 only when complying with the bulletin's inspection procedures or is it a general rule to use when starting the F-8E?
b. If it is desirable to use MANUAL to relieve a hung start, when do we switch the fuel control back to PRIMARY?

SSGT DENNIS F. MCKEE
VMF(AW)-235, Q. C.
FPO SAN FRANCISCO

▶ Answer to question (a): The *Caution Note* cited in J57 PPB 652 applies to the specified one-time inspection only.

With reference to question (b), the correct procedures, according to NavAir are contained in NA-01-45HHD-2-1 and NATOPS. The following procedures apply:

"If normal procedures fail, *troubleshoot.*"

If engine ignites and RPM remains below IDLE (68—70% rpm)

False Starts:

1. Below 25% rpm
   a. Place Throttle OFF
   b. Place master generator switch OFF
   c. Troubleshoot starting system
2. Above 25% rpm
   a. Place fuel control in EMERG
   b. Advance throttle slowly if necessary to obtain IDLE rpm (68—70%)
   c. Place fuel control switch in NORMAL

Discrepancies between the—502 and the above manuals have been referred to NavAir for appropriate action.

Very resp'y,

Headmouse

Mickey Mouse Parts Problem

Dear Headmouse:

With reference to the May 1967 issue concerning parts for Mickey Mouse ear protectors, my squadron has been unsuccessful in ordering parts because our material office would not accept your magazine as a reference.

Could you suggest a reference that the Navy will accept listing parts and prices of the ear protectors? Any help would be appreciated.

CPL G. F. CONWAY
VMO-1, MAG-26
MCAF NEW RIVER
JACKSONVILLE, N. C.

▶ Headmouse is happy to assist your material people and will fill in the gaps just in case others have a similar problem.

The Federal Stock Number of the ear protector assembly shown in the May issue has been changed to RD4240 759 3290 LF-50. Refer to *Federal Supply Catalog, Navy Management Data Listing, Bulletin 4* dated Feb 67, Vol. 12, page 5554. Cost of assy: $7.50.

For the Filter, Dome, RM 4240 674 5379 LF 50, refer to NMDL Vol. 11, dated April 67, page 4820. Price $.11.

For the Seal, Dome, RM 4240 979 4040 LF-50, refer to NMDL Vol. 17 dated April 67, page 7814. Price: $1.50 (listed in NSL of 3 April 67, page 152).

For other parts shown and listed on page 46 of the May 67 issue of APPROACH, procurement may be made locally from the David Clark Co., Inc., Worcester, Mass. according to instructions in the NMDL.

Very resp'y,

Headmouse

Each copy of APPROACH is meant for ten readers.

PASS IT ALONG!

SEEK - 2 KIT

Although the first delivery of the new SEEK-2 kit went to squadrons operating in Southeast Asia, it will be available in quantities for all pilots and aircrewmen in the near future. The kit, pictured and described on the following pages, comes in two parts: Packet 1—Medical and Packet 2—General. The packets, each in a waterproof vinyl carrying bag, contain a variety of useful survival items individually packaged and labeled. The inner surface is coated with a transfer adhesive so that the small "goodie bags" can be removed and replaced easily. The big improvement in the new SEEK-2 packets over the SEEK-1 is that they are flexible rather than rigid and can be carried comfortably in the new SV-2 survival vest (Clothing and Survival Equipment Change 26).

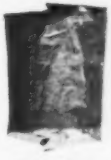
In the following chart, the "Uses and Directions" column is based primarily on MIL-S-81229B, the military specification for the kit, and on directions to be found on the individual pharmaceutical containers plus various miscellaneous sources. (The Aerospace Crew Equipment Department of the Naval Air Development Center has the project of devising a small card or booklet of directions to go in the SEEK packets. ACED is also devising a system to update the kit's pharmaceuticals.) The chart is not intended to be the last word on SEEK-2 usage. Exercise your good old American ingenuity and if you come up with some new ideas on how to put the SEEK-2 items to use, let us hear from you. A final word on the kit—some of the drugs it contains can be toxic to children so keep your SEEK packets out of their reach.

Packet No. 1 Medical

Aspirin Tablets

Anti-Malaria Tablets

Antiseptic Ointment



Bandage

Leech Repellent

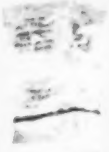
Anti-Chap Lipstick

Fungicidal Powder

Anti-Infection Tablets

Anti-Diarrhea Tablets

Sun Screen and Bug Repellent



Insect Repellent

Anti-Motion Sickness Tablets

Salt Tablets

Tweezers and Safety Pins

Liquid Soap

Eye Ointment

Band-Aids

Razor Knife

Alertness Tablets

Aluminum Foil

Packet 1: Medical

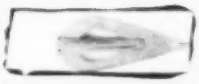
ITEM	DESCRIPTION	DIRECTIONS, USES
1. Liquid antibacterial soap	½ oz. in plastic squeeze bottle.	Shake bottle, wet skin, shake 12 drops into wet palm, work into lather. For more suds, add more water. Rinse thoroughly.
2. Gauze bandage	Approx. 2" x 5'	Use on wounds, burns.
3. Insect repellent and sun screen ointment	1 oz. in metal squeeze tube.	Prevention of sunburn, windburn, insect bites. Apply lightly to exposed skin. Keep out of eyes.
4. Razor knife	1 straight edge blade in plastic handle.	To open boils, trim ragged skin and flesh from wounds, remove embedded thorns. Flame or boil each time after initial use.
5. Fungicidal powder	.2 oz. in plastic squeeze bottle. (Some kits have .1 oz. First 5000 kits manufactured do not contain this.)	Cleanse, dry affected and adjacent areas. Dust liberally into affected areas as often as needed. Keep container dry.
6. Eye ointment (bacitracin)	⅛ oz. in metal squeeze tube.	For acute and chronic conjunctivitis, minor irritations of eye and eyelid, eye infections, injury or foreign object damage to eye. Pull down lower lid, apply small amount every 4 hours. With burns, patch and bandage injured eye shut. Do not try to wash burned eye with nonsterile water.
7. Leech repellent	½ oz. in plastic squeeze bottle.	Apply with palm of hand to exposed skin. Apply with caution around eyes and mouth. Apply along all clothing openings such as neck band, bottoms of trousers, shoe tops. External use only.
8. Liquid insect repellent	½ oz. in plastic squeeze bottle.	Shake about 12 drops into palm. Rub hands together and apply thoroughly in a thin uniform layer to exposed skin. Apply with caution around eyes and mouth. Apply along all clothing openings, headnet and mosquito mittens. Tick and leech removal.
8A. Burning lens (not in current kit)	Double convex magnifying lens.	Start fires, examine splinter wounds, etc.
9. Aspirin tablets	16, 5-grain tablets individually foil-packaged. Color code on foil: yellow.	For headaches, minor pains and fever, 1 or 2 tablets every 4 hours as required. For throat gargle. Ground into sun and bug repellent ointment (item 3), makes a paste which helps control itching of leech and insect bites.
10. Antiseptic ointment (bacitracin-neomycin sulfate)	½ oz. in metal squeeze tube.	For external use only in prevention of infection in minor cuts, abrasions, burns, dry and cracking rashes. Apply to tick or leech bite sites. 2 or 3 times daily. Very thin coat does as well as thick one.
11. Anti-diarrhea tablets	Foil-packaged. Color code: black.	2 tablets every 8 hours.
12. Anti-malaria tablets (chloroquine and primaquine phosphate)	4, individually foil-packaged. Color code: red.	1 tablet per week during or immediately after a meal. Do not chew tablet.
13. Anti-chap lipstick	1, khaki-colored (Some kits manufactured under early contract have Type I, flesh-colored.)	Prevents chapping, cracking. Khaki-colored chapstick can be used to camouflage exposed skin. Rub on pressure points to help prevent blisters, waterproof boots, cover burns, general purpose lubricant.
14. Tweezer and safety pins	1 pair 3" long with ⅛" tip. 5 pins.	Splinter, thorn removal, pin rips, pin bandages.
15. Anti-infection tablets (oxytetracycline)	18. Individually foil-packaged. Color code: blue.	For infection, severe diarrhea with fever and fever that lasts more than 24 hours after aspirin have been taken. Take 2 tablets initially, followed by 1 tablet every 6 hours. Continue for 4 days.
16. Band-aids	6, 3" x ¾", flesh-colored, individually packaged.	

17. Alertness tablets (dextro amphetamine sulfate)	5, 5-mgm., individually foil-packaged. Color code: purple.	1 tablet every 4 to 6 hours to combat fatigue and to prevent sleep. When effects of the tablets wear off, you can expect a tremendous slump as the fatigue you have prevented catches up with you. Overdosage can cause side effects. Use carefully.
18. Salt tablets	24, individually foil-wrapped. Color code: silver.	For prevention of heat exhaustion. Take 1 or 2 tablets with approximately 1 oz. of water. Take one at a time at different time intervals as they nauseate some persons. For leech removal, crush tablet and apply. Used with hot water as throat gargle and as saline solution for washing out wounds (boil water first.) Add to bouillon (item 37) to replace salt lost in diarrhea.
19. Anti-motion sickness tablets (meclizine hydrochloride)	12, individually foil-wrapped. Color code: green.	1 on life raft entry, 1 every 12 hours.
20. Anti-bacterial soap	1 3/8 oz. cake.	Scrub all minor wounds, scratches before applying antiseptic ointment (item 10).
21. Signaling mirror	1, on green nylon lanyard.	Signaling directions on back of mirror. Use to examine injuries, to aid removal of foreign body from eye, etc.
22. Waterproof matches and synthetic flint.	16 matches, 1 flint.	Start fires, light candle, sterilize needles, razor blade, knife tip, etc.
23. Combination hacksaw and blade (knife)	3 3/8" long, saw teeth on straight edge, cutting blade on other. In sheath.	Use pencil flare gun as handle. Rub flint with saw teeth to start fire.
24. Sunglasses	Wrap-around plastic glasses with elastic headband.	To reduce glare in tropic sun and arctic.
25. Fire starter sheets and tinder (cotton)	6 wax-impregnated paper sheets 2" x 3". 1 1/8 gm. cotton.	Start fires. Place the cotton so that when the hacksaw (item 23) is drawn rapidly across the length of the flint (item 22) sparks fall on the cotton and it bursts into flame.
26. Flashlight and lanyard	Miniature, 40" long lanyard with ends tied together.	For reading maps, looking for items in SEEK kit, crawling insects, etc.
27. Waterproof receptacles	2, individually foil-wrapped.	
28. Sponge	4" x 3" x 1/2"	To collect water, wash with, etc.
29. Arrowhead	2-bladed hunting head with tapered shaft. In sheath.	Attach to various size sticks, rods, limbs, etc. to make spear or arrow.
30. Candle	1, 3 1/2" long	To start fires, for light, can be rubbed on sock to make it slide over blister.
31A. Fishing kit	2 flies, 8 hooks (size 2, 3, 8 and 10). 2 lead strip sinkers, 1 1/2 oz. sinker.	
31B. Fishing line	50' of 20 lb. test nylon on flat plastic card.	
32. Compass	Compass on wrist strap with 40" nylon lanyard.	
33. Sewing kit	1 hand sewing needle, 1 carpet needle, 1 surgeon's needle, 15 yds. nylon thread, 3 safety pins. In plastic vial.	Clothes repair, sewing wounds, removing splinters, opening abscesses. Flame, boil needles before using medically.
34. Hard candy	2 pkgs., 8 pieces each.	
35. Mosquito headnet and mittens	Mittens have 10" elastic webbing on edge of gauntlet to fit snugly around forearm. Headnet has drawstring.	Apply liquid insect repellent along edge (item 8). Use to strain water before boiling it, catch minnows for bait.
36. Wire saw	21"-25" long with two detachable fittings, two swivels and two rings.	
37. Beef bouillon cubes	4, packed two each.	One cube to one cup of boiling water. Soothes digestive tract.
38. Iodine water purification tablets	50 in bottle.	Keep container tightly closed to keep tablets dry until needed. Strain water first, if possible, to filter out foreign matter. Add 2 to 3 tablets per quart, shake it until dissolved; let it stand 30 minutes or longer before drinking.
39. Light filters	Not in the first 5000 kits manufactured.	

Packet No. 2 General

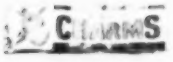
Sponge

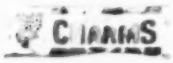
Light Filters



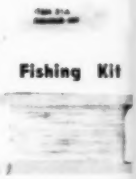
Arrowhead

Sewing Kit





Candy



Fishing Kit

Fishing Line

Wire Saw

Candle

Waterproof Receptacles

Aluminum Foil

Signaling Mirror

Sunglasses

Knife/Hacksaw Blade

Bar Soap

Fire Starter Kit

Waterproof Matches and Flint

Flashlight and Cord

Mosquito Headnet and Mittens

Wrist Compass

Water Purification Tablets

Bouillon Cubes

Medical Aspects of Survival in Southeast Asia

The following article is not intended to be absolute, uncontested doctrine on medical treatment in a jungle survival situation for in medicine as in many other areas, there are many ways of doing things. If questions arise in your mind as you read, discuss them later with your flight surgeon.

By LCDR Talvaris Turaids, MC

As with any survival material it is intended that you read this article before you find yourself in a life-threatening situation. It describes not only what you can do for yourself, but what you can do to help others. Often it will not be possible to carry out the treatment described. That is no reason why you should not know what the ideal therapy should be. Circumstances permitting, you can then always try the next best thing possible.

You may also feel that description of certain diseases prevalent in Southeast Asia is unnecessary if they cannot be cured in the field. However, if your skin and eyeballs should turn a bright yellow, or if you should have severe chills and fever every other day, you will certainly want to know the reason and what to expect.

Don't expect to learn a set of rules to be observed verbatim in medical problems as you would in an inflight emergency. There are no definite rules to be followed point by point in the treatment of disease. Every person is unique in his reaction to an illness and, therefore, treatment must be individualized. That is why medicine is an art and not a science.

Emergency First Aid Measures

Management of external hemorrhage: Place a sterile pad directly over the wound and apply pressure by hand or firm dressing. A compression bandage will stop bleeding from most wounds in about 10 minutes. In case of a wound in an extremity, elevate the part. Compression above the wound ("pressure points") is used only to allow time for fashioning of a tourniquet or to permit grasping of a bleeder with a surgical instrument. Use a tourniquet only when bleeding cannot be controlled by safer methods; as a rule, it is required only when a major blood vessel has been opened. Using padding wherever possible, apply the tourniquet tightly at first to be certain that bleeding has been controlled. Then release the tourniquet slowly until slight oozing from the wound is seen. At this point apply slight further pressure, the objective being to control bleeding with the least possible pressure so that danger of nerve damage and injury to other tissues will be minimized. Release the tourniquet slowly every 20 to 30 minutes for several seconds or until bleeding starts. Freshly-made spider webs applied to a wound are said to assist blood coagulation.

Management of respiratory obstruction: Upper respiratory obstruction may occur in (1) the unconscious patient whose tongue falls back and whose mucus collects in the back of the mouth and trachea (windpipe); (2) fractured lower jaw or a wound of the mouth with a swollen immobile tongue and inability to clear mucus and blood; (3) chest injuries with inability to cough up material in trachea, largely because of pain.

Treatment for (1) above: turn patient on side with face pointing down, letting the force of gravity

clear the airway (also transport such patients in this manner). Use your finger to remove stringy mucus from the throat. First aid kits carried by medics should contain an "airway"— a rubber or plastic device which is inserted in the mouth to hold the tongue down and provide unobstructed flow of air. It is not recommended that you try to fashion such an airway from materials at hand. Don't turn a patient over on his abdomen as then his breathing will be compromised.

For (2), treatment is same as above, but if a serious obstruction exists and the patient is obviously in dire need of air, emergency tracheotomy may be required to save his life. Take a pocket knife and holding the blade horizontally, make a stabbing wound immediately below the "Adam's apple" (thyroid cartilage) and above the next ring of cartilage (cricoid). It is most important to go in exactly at the midline and not to penetrate deeper than ½". Then turn the blade vertically—you will now have an opening into the trachea. Insert some small tubular object (top of a fountain pen, piece of bamboo) to keep the airway open. *Needless to say, this seemingly simple procedure may be extremely dangerous in the hands of a novice. Discuss the procedure with your flight surgeon.*

For (3), fix chest wall by strapping to minimize motion on breathing and thus reduce pain. Morphine tends to depress respiration; it should be given with caution especially if a head injury is also present. Inject sites of rib fractures with local anesthetic if available.

NOTE: Arrest of hemorrhage and the relief of respiratory obstruction take precedence over all other procedures.

Wound Care

Definitive wound care: If it is possible to transport the victim to a first-aid station or hospital, leave wound care to practitioners of the art. Determine the general condition of the patient and perform emergency first aid measures. Apply a sterile dressing to open injuries after removal of gross foreign debris. Expose the wound itself as little as possible—most infesting organisms come from the hands and noses of attendants, onlookers, and the patient. A brief look to determine the site and probable extent of the wound is all that is required. Splints may be needed in any injury to the extremities. Treat for pain and shock if present and wait for the helicopter.

Under less ideal conditions, you may have to treat the injury yourself. Utmost attention to sterile technique cannot be overemphasized. Wash surrounding skin thoroughly with mild soap or antiseptic solution. Do not pour antiseptic into the wound. Use sterile water (boiled or treated with purification tablets). Freshly voided urine is normally sterile and may be used. Make a careful search for foreign bodies of any sort. Dead tissue also acts as a foreign body in delaying wound healing and providing a fertile field for bacterial growth. Cut away damaged skin edges but take care to remove no more than necessary as judged by the color of the skin. Loose pieces of fat and dead muscle tissue (torn, discolored and infiltrated with blood) are next removed.

When all gross dirt and dead tissue have been removed, irrigate the wound thoroughly with sterile water (saline is preferred—add four salt tablets per pint of water) to wash out the smaller, invisible contaminants. Then apply a sterile dressing. If you have none, use cloth (strips of shirt, underwear, parachute, etc.) that has been boiled for at least 20 minutes.

Try to draw the edges of the wound together with the bandage as this will speed healing. Pack large wounds lightly open with fluffed gauze. Keep the wounded part at rest. Don't use antibiotic tablets unless infection develops. Maggots will help clean a wound since they feed only on dead tissue. Do not cover a wound when maggots are present.

Types of Wounds

Abrasions are caused by scraping off the outer layers of the skin. They are easily infected by bacteria-laden foreign bodies ground into the abraded surface. Thorough cleansing with soap and water is necessary. Apply antibiotic ointment and sterile dressing.

Incised wounds bleed easily since the vessels have been cut cleanly by a sharp object such as a knife or broken glass. These wounds are less likely to become infected since there is little tissue damage and usually little foreign material is carried into the wound. Also, the profuse blood flow tends to wash out infective material.

Lacerations or tears are produced by blunt objects (shell fragments, etc.). Such wounds have torn, uneven edges and dead tissue and foreign matter is frequently present. Hemorrhage is seldom severe since the vessels are irregularly torn across. Infection usually follows without adequate treatment.

Puncture wounds are caused by penetrating instruments (knives, bayonets, punji stakes). These wounds are excellent sites for infection since they do not bleed freely and point of entry seals over quickly. Thorough cleansing and removal of foreign material is essential (the wound may have to be widened).

Gunshot wounds: The bullet is sterile but may carry fragments of contaminated clothing or skin

into the depth of the wound. Do not attempt to probe and search for the bullet unless it is superficial and easily removed. The chances are that it will cause no serious harm if it has not already done so.

Fractures

Fractures: Improvise splints and immobilize the joint above and below the fracture. Do not attempt to set a fracture. In case of a compound fracture (bones sticking through the skin), remove any completely loose bone fragments, but do not attempt to put the bone ends back inside the wound. Clean the wound, dress, splint, treat for pain, and take antibiotic pills.

Beriberi

Beriberi or thiamine (Vitamin B_1) deficiency has been recognized for centuries in the Orient but is rarely seen in the West except in chronic alcoholics. It is the disease associated with ignorance and poverty and usually occurs in states of general malnutrition. At least three months on a grossly deficient diet are required for the development of beri-beri.

Symptoms: Onset is marked by gradually increasing fatigability, irritability, heart palpitations, and muscle tenderness (especially leg pains). The disease may affect chiefly the nervous system characterized by tingling and weakness of extremities followed by muscle wasting and contractures, or the circulatory system characterized by gradual heart failure and swelling of the legs.

Prevention and treatment: The specific therapy is thiamine. Yeast, liver, kidney, whole grains, nuts, eggs, and greens (vegetables, weeds, grass, leaves, etc.) are the best sources of this vitamin. It is practically absent in polished white rice. Foods must not be overcooked since excessive heat destroys vitamin B_1. Cook the foods in as little water as possible and use the water in soups and broth.

Burns

Burns are tissue injuries caused by a wide variety of agents including flame, hot water, steam, electricity and chemicals. General principles of treatment are the same in all. Burns are classified into three types according to the depth or degree of burn.

First-degree burn involves only the outer layer and follows prolonged exposure to sunlight or instantaneous exposure to more intense heat. There is redness, pain, and a slight amount of swelling. Since this is only a superficial injury, the capacity of the skin to prevent infection is retained. Healing takes place in three to six days. No treatment is required.

Second-degree burn is a slightly deeper injury characterized by blisters, pain, and considerable swelling. Morphine may be required for pain. Healing occurs uneventfully in two or three weeks unless infection occurs. All dirt, grease, adherent clothing and dead "shaggy" tissue dangling from the burn should be removed. Wash carefully with bland soap and sterile (boiled) water. Apply antibiotic ointment. Do not open blisters. Cover with sterile gauze and a pressure bandage. Change the dressing after five to eight days. Burns will heal better if immobilized and elevated. For infected burns take antibiotic tablets (one every six hours) and apply continuous hot wet compresses.

Third-degree burn is a very severe form of injury. There is destruction of the full thickness of skin (charring) and frequently of deeper structures also. Treatment for small areas is identical with that outlined above. However, when more than limited areas of the body surface are involved, hospitalization and intensive care is required or death may occur.

Bacillary Dysentery

Diarrhea, meaning frequent passage of unformed stools, is not a disease in itself but only a symptom of some other disease. One of the worst kinds of diarrhea occurs in bacillary dysentery, an acute infection of the large bowel caused by bacteria. There may be four to six bowel movements per hour and the stools may contain mucus, pus and blood. Abdominal cramps, malaise (weakness), fever and ineffectual, painful straining at stool are present. This disease is widespread throughout the world in areas where sanitation is poor and is particularly common in the tropics. The source is the excreta of infected individuals. Contagion is usually through feces-contaminated food, water or fingers. Flies also serve to spread the disease.

Spontaneous recovery within four to eight days is usual. However, with the passage of 20 or more watery stools a day, weight loss and dehydration may become severe. The most important preventive measures are strict attention to personal hygiene, adequate sanitation, fly control and proper safeguarding of food and water supplies.

Treatment: Take four oxytetracycline tablets initially and two tablets every six hours for two days and one tablet every six hours for another four days. (This differs from the dosage in the SEEK-2 kit which contains fewer tablets.) Take two antidiarrhea tablets four times daily. Diet is said to be unimportant; however, a bland diet moderately restricted in amount may be effective. Bouillon cubes (one cube dissolved in a cup of water and then cooled) are very soothing to an upset gut. Drink plenty of liquids, with one or two salt tablets per pint of water.

Abdominal pain and discomfort are usually re-

lieved by the application of heat; rarely, morphine may be required. Charcoal can help. Scrape off the charred portions from a partially burned piece of wood and swallow them (a teaspoon every four hours up to a handful a day). Bones ground to a powder or burned and ground into ash may help. Tannic acid, present in commercial tea, tea made from boiled guava leaves, and in tree bark, is an age-old remedy for diarrhea. Boil tree bark (preferably oak) for 12 hours to three days, adding water as needed. The resulting brew will be pitch black, unspeakably vile-tasting and evil-smelling. Try drinking three to four tablespoons a day. (All survival manuals recommend this remedy as very effective, possibly because by the time the brew is ready, the diarrhea has begun to subside anyway. Also, watching the pot and constantly stirring the brew will help take your mind off other matters.)

Heat Disorders

Sweating is the most effective natural means of combating heat stress. So long as sweating continues, provided water and salt are replaced, man can withstand remarkably high temperatures. Thus, adequate water and salt intake and protection from the sun and heat will protect from the following:

Heat exhaustion results from physical exertion in a hot environment. Weakness, vertigo, dizziness, headache, nausea and faintness may precede collapse. The victim is listless and apprehensive. Skin is ashen, cold and wet; perspiration is profuse. This is a nonfatal physiological disturbance and recovery is excellent. Place the patient in a cool environment, and loosen tight clothing. Give plenty of cool water with one or two salt tablets per pint.

Heat cramps are painful contractions of abdominal or skeletal muscles caused by exertion in a hot environment when body fluids have been depleted of salt by unreplaced heavy losses in sweat. The victim may be prostrate with legs drawn up or thrashing about, grimacing and occasionally crying out from the excruciating pain. Treatment is the same as in heat exhaustion.

Heat stroke (sunstroke) may be rapidly fatal. Prolonged exposure to excessively high temperatures or the direct rays of the sun, combined with high humidity are the responsible factors. There is a breakdown of the sweating mechanism. The skin is hot and dry, very high fever is present, and mental confusion, staggering gait, convulsions or coma may occur. Hydration and salt content of the body are normal. The aim of treatment is to reduce body temperature to a safe range (102° F. or lower) as rapidly as possible or irreversible brain damage may occur. Ideally, total immersion in an ice bath or in water as cold as possible is the most efficient method of cooling. Vigorous massage of the limbs during cooling is important.

Infectious Hepatitis

Infectious hepatitis is an acute infection of the liver caused by viruses introduced by feces-contaminated food and water. Crowding, poor sanitation and malnutrition are predisposing factors.

Symptoms: Onset usually is abrupt with fever, marked loss of appetite, malaise, distaste for tobacco, fatigability, headache, chilly sensations, nausea, vomiting, upper abdominal (liver) pain, itchy skin, light stool and dark urine. About five days after onset, jaundice appears (yellowness of skin and eyes from bile pigments) but fever and other symptoms tend to subside. The jaundice deepens rapidly, reaching a maximum within a week, and then fades gradually in one to six weeks.

Treatment: There are no specific drugs. Bed rest during the period of worsening symptoms and increasing jaundice is most important, but as we acknowledged at the beginning of this article, impossible in a survival situation. The type of diet is not important though bland food may lead to less nausea. However, you have to keep up an adequate caloric intake which is difficult when appetite is totally lacking. Force yourself to eat. Understand that the disease is rarely fatal and seldom leads to chronic liver disease. Although symptoms may seem prolonged, recovery will be complete with no lifelong need for diet or avoidance of alcohol.

Infection

The cardinal signs of infection or inflammation are redness, swelling, pain and warmth surrounding a wound. In tropical climates, moisture, heat and less than ideal hygiene combine to encourage infection in the most minor of wounds. In an apparently small wound caused by a punji stake dipped in human excreta, a horrible infection can boil up within a few hours. Hence it is most important to clean and dress even the smallest scratch, cut or insect bite and use antibiotic ointment on it. Keep your fingernails short to prevent infection from scratching. An intact, healthy skin is the first line of defense against infection.

Cellulitis is any inflammation of the tissues that shows a tendency to spread. It means that the invading germs are overcoming your body's defenses against infection. Locally, the area is red, swollen, painful and warm with poorly defined borders. Fever, chills, malaise and headache may be present. Lymphangitis (spread along lymphatic channels draining the infection as evidenced by red streaks on the skin) and lymphadenitis (painful enlarged,

tender nodes or glands into which the lymphatic channels drain) usually develop. Appearance of the red streaks is erroneously called "blood poisoning." This term is best applied to a rarer complication (bacteremia) where there is widespread distribution of infective material by way of the blood stream.

Treatment of cellulitis: The part involved should be put at rest and elevated when possible. Apply hot wet compresses for several hours each day. Change the compresses as often as necessary to maintain heat. Take antibiotic (oxytetracycline) two tablets four times daily for three days and one tablet four times daily for another four to seven days. Take aspirin for the relief of pain and fever.

Abscess: An abscess or boil is a localization of an infection into a pocket of pus. When the infection "comes to a head" the skin above the yellow or white pus must be cut to allow the pus to drain out so that the wound or boil will heal. Make a generous incision, express the pus gently and pack the wound open. Continue hot compresses and keep repacking daily or more often to allow healing from the bottom up.

Furuncle: A furuncle is a small abscess of a sweat gland or hair follicle. Treatment consists of hot packs and, if necessary, incision and drainage. Don't squeeze or cut before localization of pus. Antibiotic tablets are rarely indicated. Never squeeze furuncles on the face.

Carbuncle: A carbuncle is a group of adjacent furuncles with extension of infection under the skin. The back of the neck is a common site. Fever and malaise may be present. Hot packs, incision and drainage and antibiotics may be required.

Skin rashes may arise from a legion of causes (bacterial, viral, or fungal infections, allergies, contact with certain plants, etc.). It would be impossible to try describing the various skin diseases here. Even dermatologists are frequently perplexed. Clean affected areas frequently with soap and water and apply antibiotic ointment if they look infected. Try to keep wet or weeping areas dry. Apply fat or vaseline to dry and cracking areas.

Insect Bites

Many insects are disease carriers, notably mosquitoes, the common housefly, fleas, lice, ticks, sandflies and chiggers, to name a few. Insect bites can also result in severe secondary infections.

Prevention and treatment: Apply insect repellent or use green wood smoke to smoke up exposed parts. Keep your clothing loose (mosquitoes can easily bite through light clothing). Tie the cuffs of your jacket and tuck trouser legs into boots. Use the mosquito head net correctly, especially at dawn and dusk. In the absence of insect repellent, use mud, the simplest protection against mosquitoes.

Coconut oil, tobacco juice or lime juice protect against head lice. Check your body and clothes frequently and remove all ticks and lice. Look particularly at the hairy portions of the body and where clothing is tight. Remove ticks carefully. Steady pulling is preferable to crushing. If the head of the tick remains in the skin infection will result. Touching with a glowing cigarette or the application of insect repellent, kerosene, oil, or tobacco juice facilitates removal without leaving embedded remnants. Wash the site with soap and water and apply bacitracin ointment from Packet 1 of your SEEK-2. (A paste of aspirin and animal fat makes a good anti-itch cream.)

Leech Infestation

Bloodsucking leeches are found in lakes, ponds, and damp tropical forests (particularly during the rainy season) and vary in size from a few millimeters to several centimeters in length. They cling to blades of grass, leaves and twigs and attach themselves firmly to any passing individual. Their salivary gland secretion prevents the clotting of blood so that the wound continues to bleed after they have detached themselves. With heavy infestations, significant amounts of blood can be lost. Rarely, young leeches may be swallowed in drinking water, an event that can lead to serious illness.

Prevention and treatment: Keep pants legs tied tight around boot tops or inside tightly-laced boots when wading or walking through brush or grass. Examine your body frequently in bad leech country. Leeches should be removed with care lest their jaws be left in the wound. Severe secondary bacterial infection and ulceration of the wound may result through improper removal. Remove leeches gently and carefully. Do not hurry the process. Application of wet salt, vinegar, tobacco or lime juice, crushed iodine tablet, alcohol, dry ashes, or burning cigarette will facilitate removal. Then apply bacitracin ointment and cover the site with a bandaid.

Malaria

Malaria is an acute, sometimes chronic, often recurrent febrile disease caused by several species of a one-celled parasite transmitted to man by the bite of the Anopheles mosquito.

Symptoms: The parasites attack the red blood cells wherein they divide repeatedly until the cells burst. The liberated parasites then attack new blood cells. It is this periodic breaking up of red blood cells which causes the chills and fever so characteristic of malaria. One to four weeks after infection, there is a period of a week or more of non-specific

symptoms frequently unrecognized as malaria and treated as influenza.

An abrupt onset of chills follows, lasting 20 to 60 minutes (cold stage). The victim has chilly sensations over his entire body, his teeth chatter, his skin becomes blue and cold, and there is uncontrollable shaking. A "hot stage" follows, lasting about two hours, with temperatures of 104 to 107° F. The victim has a flushed face, excruciating headache, and may be partially delirious. There is a sensation of intense heat with a hot, dry skin. This is followed by an abrupt onset of the "sweating stage" in which he breaks out into profuse perspiration, his temperature drops to normal, his headache disappears and a feeling of well-being returns. Although weak and exhausted, he feels able to resume work. These paroxysms of chills and fever may occur daily, on alternate days, or with an interval of three days in between.

Treatment: Take one antimalaria pill a week (chloroquine-primaquine combination) during your stay in countries where malaria is prevalent. These pills will prevent malaria from developing or, in case of an infection, will cure it. Continue taking the drug for at least four weeks after leaving a malarial zone.

Snakebite

The most important point to keep in mind about snakebite is that, although serious, snakebite poisoning is usually neither fatal nor permanently disabling.

Prevention: Basic types of snake venoms are either hemotoxic (destroys the blood cells) or neurotoxic (attacks the nervous system). Depending on the type and amount of venom injected, one may have severe pain in the local site within a few minutes, rapid swelling and discoloration of skin with formation of blisters, and continued oozing of blood and tissue fluids from the puncture site. General body effects may include circulatory collapse, clammy skin, fast heartbeat, intense thirst, severe headache, dizziness, blurred vision, muscle spasms, vomiting of blood, fever, respiratory failure and convulsions. Maximum venom effects usually occur in 24 to 36 hours. If fang marks are absent and there is no significant pain, swelling, or numbness at the bite site or tingling of the scalp, lips or tongue within 20 minutes, one may assume that the snake was probably nonpoisonous.

Treatment: The objective of treatment is to slow the absorption of the venom so that it can be detoxified by the natural defensive mechanisms of the body. (*We are omitting here discussion of treatment by injections of antivenom and ice packs since neither are available in the typical jungle survival situation.—Ed.*)

- Kill the snake if possible and search for presence of fangs. Spend only a few moments at this. (Snake meat, including that of poisonous species, is a delicacy.)
- Lie down at once; apply a tight tourniquet 2 to 4″ above the bite. Release the tourniquet every 20 minutes. Reapply ahead of the swelling if the swelling progresses.
- Remain as quiet as possible, for 24 hours, if feasible. Keep the bite site completely immobile and below heart level.
- Wash the surface of the bite thoroughly.
- Take antibiotic (oxytetracycline) tablets, one every six hours.
- Drink plenty of fluids.

Do not become excited, hysterical or panicky. Don't cut into the bite site (absorption of venom will be enhanced from a larger wound; also, there will be more chance of subsequent infection). Don't use alcohol; it speeds up metabolism and absorption. Don't use morphine which may cause respiratory failure in the presence of neurotoxic venom.

Trachoma

Trachoma is a serious and chronic viral infection of the eye which may lead to blindness. It is widely prevalent in the tropics and areas with poor sanitary conditions and low standards of living. Transmission is by flies, fingers and contaminated articles of clothing. Trachoma may begin slowly or acutely with severe conjunctivitis (pink eye), itching, pain, swelling of lids and abundant discharge of pus. To prevent infection, observe fly control and do not rub your eyes with dirty fingers or rags. Use bacitracin ophthalmic ointment as soon as *any* eye infection develops. Pull down lower eyelid and apply a small amount of the ointment every four hours.

Worms

Several species of intestinal parasites are easily acquired in tropical countries. Symptoms vary, depending on the type of worm or worms present. However, you will not ordinarily be incapacitated, even with a long-standing infestation. Many natives live with them all their lives. Stress personal and environmental hygiene.

Vegetables grown in areas where human excreta is used for fertilizer should be thoroughly washed and preferably cooked. Some survival manuals recommend gasoline or kerosene, one teaspoon or more daily for four or five days. *Don't do it!* Serious liver and kidney damage or pneumonia may result. Two teaspoons of kerosene have been known to be fatal. (Drug of choice for most worms is piperazine.) ◄

LCDR Ron Amalong, MC

The Bubble in the Viper's Eye

"A viper in a vacuum with a bubble in its eye" sounds like a line from one of the characters in *The Snake Pit,* but it is not. A bubble was observed in the eye of a viper which had been placed in a vacuum container as part of a scientific experiment by Robert Boyle (Boyle's Gas Law) in the year 1670. Boyle's observation was probably the first recognition of decompression sickness, often called dysbarism (the prefix "dys" meaning abnormal or painful, and "barism" deriving from the Greek word for atmosphere).

More familiar terms for the host of problems which encompass decompression sickness are such obstructive-sounding words as "ear block" and "sinus block," and a group of words which might describe the newest dance crazes, "the bends," "the chokes," "the itch," and "the shakes."

At sea-level, gases in the body are dissolved and diffuse quietly without fuss or harm. When these gas particles become exposed to a reduced atmospheric pressure, especially above FL 300, they expand in the same manner as any other gas and become bubbles. Nitrogen (78% of the air we breathe) especially begins to bubble belligerently. The effect is not unlike that of a carbonated beverage when the cap is removed. As these bubbles expand they exert force on the tissue around them. It is this physiologic fizz which causes the symptoms of the bends, chokes, itch, and shakes.

Bends are the manifestation of bubble generation in the vicinity of where we bend—the joints. Boring or aching pain is felt deep in the joints, bones, or muscles and is most frequently encountered in the knees and shoulders.

The itch gives itching and hot/cold sensations when the gas bubbles collect under the skin, in the pores, and in the sweat glands. Some have described the sensation as being like a colony of ants crawling in a group procession over the body but it's no picnic.

The chokes is a type of decompression sickness which causes burning or gnawing discomfort in the chest under the breastbone. A dry hacking cough and a feeling of suffocation may develop as the gas bubbles transmit the blood vessels in the lungs. The chokes is less common than the bends. The shakes is a rare manifestation of decompression sickness which involves the nervous system.

In severe cases of decompression sickness, complications can occur which seriously compromise the circulation and the nervous system. Blurring of vision, double vision, shock and aeroembolism (a bubble acting like a blood clot and getting hung up in the heart or brain) are among these manifestations.

Decompression sickness rarely occurs below FL 200 (cabin pressure) and is most common above FL 300. Rare cases have occurred as low as 10,000'. Fifty percent of men who are exposed to FL 300 actual altitude and who engage in moderate physical activity will develop symptoms.

The longer the exposure, the greater the number of people who will be affected. Low temperatures (−10° F.) nearly double the incidence of severe symptoms. Perhaps because body metabolism is lower in the morning than in the afternoon, more cases seem to appear before noon than after. Exercise at altitude increases the severity; increased age and obesity increase susceptibility. Fat contains more nitrogen than other tissue and when the cork is popped, fat acts like the champagne of bends.

Poor physical fitness, hypoxia, unbalanced diet and repeated exposure to low atmospheric pressures are other factors which increase susceptibility.

It would seem that prevention would be enhanced by getting rid of some nitrogen gas before being exposed to high altitudes. And so it is! This is NOT accomplished by eliminating the gas of a baked bean and sauerkraut lunch, but can be accomplished by breathing 100% oxygen for two hours prior to high altitude flights. A bit impractical? Yes! Fortunately the cabin pressurization systems maintain a safe pressure and keep the nitrogen bubbles in harmless solution. If cabin pressurization is lost, the only remedy is to descend with as little physical exertion as possible. Rubbing, scratching, or bending an affected area will only aggravate the problem. Constant guarding against obesity helps to keep the cap on the potential seltzer of fat deposits. ◄

No Anti-Exposure Suits

AN hour before launch, weathervision, a closed circuit TV network available in each flight planning area on the base, showed a water temperature of 47°, air temperature 63°. Water temperature at destination was 51°. Neither pilot nor crewman of an F-4 wore an anti-exposure suit.

When the aircraft became uncontrollable, both men ejected successfully. After spending a few minutes in the water and almost an hour in their rafts in wet clothing with a 10 kt wind blowing, they were rescued by a private boat. They reboarded their rafts for helicopter pickup. Both men were sufficiently chilled to continue to shiver for more than 15 minutes after arriving at the hospital and being given dry clothing and hot coffee. Had their stay in the rafts been extended any significant amount of time, the investigating flight surgeon reported, both men would certainly have suffered serious effects from exposure.

OpNavInst 3710.7D, General NATOPS, states that "the latest available type continuous-wear or quick donning anti-exposure suits, as appropriate, shall be provided for crewmembers and passengers of operational type naval aircraft on overwater flights proceeding beyond gliding distance from land when the water temperature is 59°F or below, the outside air temperature (OAT) is 32° or below, or the combined OAT/water temperature is 120° F. or below. The final determination with regard to the actual wearing of anti-exposure suits shall be made by the commanding officer of the unit concerned based on all pertinent factors. . ."

"The fact that the pilot and crewman were only chilled after one hour of repeated dunking in the water and a return trip of 70 miles in a helicopter to the hospital can only be attributed to the very favorable low windchill factor which existed," investigators reported. "This accident only provides additional evidence to support adherence to at least the minimum standards outlined in OpNavInst 3710.7(D) with regard to the use of anti-exposure suits. The 'gliding distance from land' escape clause becomes meaningless in a mishap of this nature."

"The marginal probability of survival without anti-exposure suits when the water temperature is at the minimum levels stated in OpNavInst 3710.7(D) should be re-emphasized to all aircrewmen," investigators recommended. "The particular relief clause which permits non-utilization of anti-exposure suits with water temperature down to 50°F when within gliding distance of land should be exercised with great discretion because of the ever-present possibility of the requirement for ejection with little warning."

Flares in Mk-3C

BOTH pilot and NFO in an F-4B ejection over water failed to recall that there are two Mk-13 Mod 0 day/night distress signal flares in the Mk-3C life preserver. They opened their seat pans and used the flares from this source to signal orbiting aircraft.

All you have to do to get to the two flares in an uninflated Mk-3C is unsnap the flaps. When the Mk-3C is inflated, push the flotation tube down with one arm and, with your free hand, pull out the flare which will be between the tube and your body.

The Mk-3C also contains two packets of dye marker.

Bird Strike

AN A-4C en route to an inland target was struck on the starboard windscreen and vertical stabilizer by a bird. The aircraft experienced total hydraulic failure. Employing emergency measures, the pilot slow-flighted and diverted to an airfield. At the time of the incident, he was flying with his helmet visor down. He sustained only a small cut on his neck from the flying plexiglass.

Drogue Gun Piston

THE drogue gun piston has figured in a number of reports of parachute descent after ejection. In one instance the pilot was struck on his helmet by the piston hanging just above eye level. He watched it during the remainder of his descent and had to fend it off a couple of times to keep from getting hit. In a second case, the ejectee oscillated in his parachute with the drogue gun piston swing-

ing back and forth near his head. He was able to grab it and cut it free with his shroud cutter.

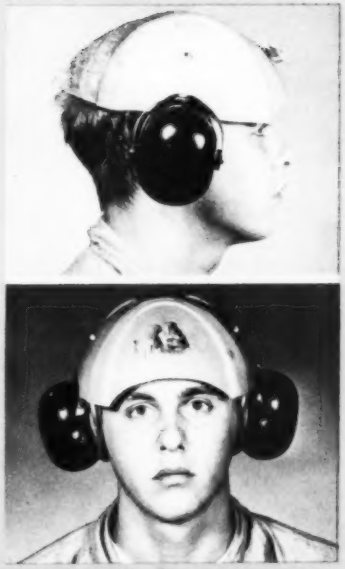
Air Crew Systems Change 99 of April, 1967 provides for shortening the drogue parachute assembly connecting line by 2'. This should put the drogue gun piston out of range of the survivor's head.

Survival Success Story

WHEN a helicopter was ditched at sea following sudden complete power loss, all persons aboard turned in what the investigating flight surgeon described as a professional survival performance.

"The training of the personnel aboard played an important part in the egress, survival and rescue phases of the accident," he reported. "All escaped properly and without difficulty or panic from the aircraft while it was in an abnormal position in the water (rolling to the right). The pilots, for example exited the right cockpit hatch when it was underwater and the aircraft was rolling to the right to an inverted position. The water survival and rescue phases were also done properly and without difficulty except for one crewman who pulled only one mae west toggle. All persons involved credited previous escape and survival training with being a major factor in their successful egress, survival and rescue and in their lack of panic or confusion during these phases of the accident."

As stated before, training and practice pay off in emergencies.



This FORRESTAL flight deck crewman survived the carrier's July 1967 disaster uninjured because he was wearing a protective helmet as shown above. The helmet, locally modified per *Clothing and Survival Equipment Change 10*, stopped the piece of shrapnel still embedded in it. The Naval Air Systems Command has completed evaluation of a standardized flight deck crewman's helmet and procurement is in progress.

Expect the Unexpected

AFTER investigating a UH-2A ditching at sea, the flight surgeon board member reported that several items of survival and signalling equipment were not carried by various crewmembers. These included knives, SEEK-2 kits, pencil flare gun kits, etc. The flight was briefed and flown as only a day plane guard mission, never out of visual range of the carrier, the flight surgeon states, and such equipment was not needed in this particular accident.

"However," he continues, "a great many circumstances might have arisen on this flight, as on any flight, which might well have made the use of such equipment helpful, if not mandatory, to ensure survival and rescue. Such equipment was issued for an obvious purpose, and one should always be prepared for the unexpected in this business of aviation where the unexpected often happens more often than the expected. When one is not prepared in every way possible for the unexpected when it happens, it is usually too late to do anything about it and lives are lost."

The flight surgeon recommends that all items of personal safety and survival equipment be carried on all flights regardless of the expected lack of need for them.

The UH-2A/UH-2B NATOPS Flight Manual states "an approved survival knife and sheath not to be worn exposed or attached to the life preserver but stored in a special canvas pocket sewn to the flight suit shall be worn or carried. Personal survival kits will be carried at all times by pilots and crewmembers when engaged in operations and training missions away from home base. A pistol with tracer or an approved substitute will be worn by all crewmembers for all night flights and for all flights, night or day, over water or sparsely populated areas." (The pencil flare gun is an approved substitute.)

Operational necessity may dictate a temporary fix for mission accomplishment. It may work once, or even twice, but don't trust your luck too far. . . .

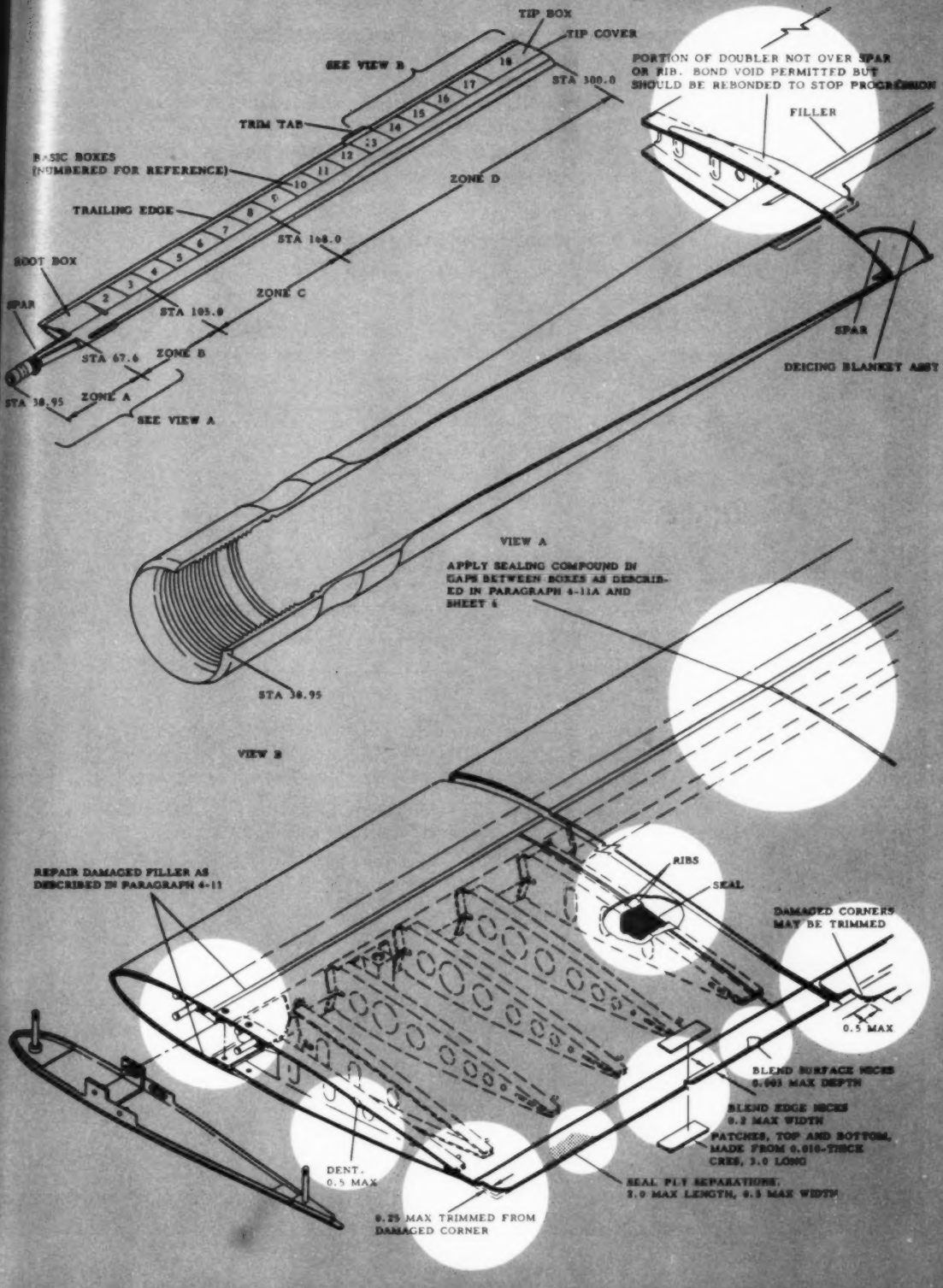
Care and Repair of Rotor Blades

Failure of a CH-46A forward rotor blade in flight resulted in the helo's fuselage breaking up in midair.

Investigation revealed the forward yellow rotor blade had a .30 caliber bullet hole in the bottom side of the spar at a point 10'7" from the tip and that the hole had been covered by metal foil tape.

Investigators deduced that the blade failure started some 97 flight hours earlier. The spar was fractured through this hole and showed evidence of fatigue for a distance of about 1" on each side of the hole.

This accident strongly suggests a review of certain criteria for helo blade repair and replacement. While these parameters are for the CH-46A, there's a lesson in it for all helo blade inspectors. For complete details for the care and repair of


TIP BOX
TIP COVER
SEE VIEW B
STA 300.0
TRIM TAB
BASIC BOXES
(NUMBERED FOR REFERENCE)
TRAILING EDGE
ZONE D
STA 168.0
ROOT BOX
SPAR
ZONE C
STA 105.0
STA 67.6
ZONE B
STA 38.95
ZONE A
SEE VIEW A
PORTION OF DOUBLER NOT OVER SPAR OR RIB. BOND VOID PERMITTED BUT SHOULD BE REBONDED TO STOP PROGRESSION
FILLER
SPAR
DEICING BLANKET ASSY
VIEW A
APPLY SEALING COMPOUND IN GAPS BETWEEN BOXES AS DESCRIBED IN PARAGRAPH 4-11A AND SHEET 4
STA 38.95
VIEW B
REPAIR DAMAGED FILLER AS DESCRIBED IN PARAGRAPH 4-11
RIBS
SEAL
DAMAGED CORNERS MAY BE TRIMMED
0.5 MAX
BLEND SURFACE NICKS 0.003 MAX DEPTH
BLEND EDGE NICKS 0.2 MAX WIDTH
PATCHES, TOP AND BOTTOM, MADE FROM 0.010-THICK CRES, 3.0 LONG
DENT. 0.5 MAX
SEAL PLY SEPARATIONS. 3.0 MAX LENGTH, 0.5 MAX WIDTH
0.25 MAX TRIMMED FROM DAMAGED CORNER

CH-46A Blades, refer to *NavWeps 01-250-HDA-3*, Chapter 4. Operators of other model helos should refer to the applicable structural repair manual.

Look these guidelines over carefully. Remember, when it comes to judging the reliability of these vital elements of helo lift and control, your knowledge will be a major factor in the commander's go, or no-go decision.

CH-46 ROTOR BLADES
Inspection, Repair, Replacement Criteria

Part	Damage	Disposition
Spar	Scratches, Nicks, Corrosion Pits	Zone A Blend to width 30 times depth. 0.020 max depth Zone B Blend to width 50 times depth. 0.010 max depth, 1.0 max chordwise Zone C Blend to width 40 times depth. 0.007 max depth. 1.0 max chordwise Zone D Blend to width 50 times depth. 0.005 max depth. 1.0 max chordwise Scratches in dents must not exceed 50% of depth limits given
	Dents	If depth is less than 0.020 with width greater than 75 times depth, or depth is less than 0.045 with width greater than 150 times depth, inspect for cracks with dye penetrant If depth is greater than 0.020 with width less than 75 times depth, or depth is greater than 0.045, replace rotor blade
	Worn or Eroded Plating	Replace as described in section I
	Holes, Cracks, Damage Exceeds Limits	Not permitted. Replace rotor blade
Leading Edge Protective Strip	Nicks, Scratches, Corrosion Pits	If depth is greater than 0.003, blend out
	Cracks	Remove to width 10 times length. 0.250 max depth from edge
	Unbonding	100% of finger at inboard end. Repair as described in para 4-12A. Outboard end 1.0 max spanwise, 2.0 max chordwise, or 2.0 max spanwise, 1.0 max chordwise. Remaining areas 0.250 max depth, 4.0 max chordwise
Boxes	Oil Canning	Check for unbonding
	Wrinkles	Permitted. Check for cracks
	Unbonding (See Sheet 6)	Max 6 boxes containing voids within limits shown. To 18.0 max accumulated length in one rotor blade. Repair as described in Para 4-12
	Ply Separation in Fiber Glass Skin (See View B)	2.0 max length, 1.0 max width, between ribs. If ply separation extends to skin edge, fill with resin as described in para 4-12. Encircle ply separations with contrasting color paint and inspect for progression periodically
	Cracks in Aluminum Skin	3.0 max length between ribs, no closer than 0.25 to skin edge
	Cracks in Fiberglass Skin	3.0 max length and not closer than 0.25 to rib, 1.50 to skin leading edge, 2.75 to skin trailing edge
	Holes	1.0 max diameter. Repair as described in para 4-12
	Nicks, Scratches in Aluminum Skin	0.003 max depth
	Nicks, Scratches in Fiber Glass Skin	Repair as described in para 4-12
	Dents (See View B)	0.50 max depth. Dents may not affect more than 2 successive ribs nor more than 10 boxes
	Damage Exceeds Limits	Not permitted. Replace rotor blade

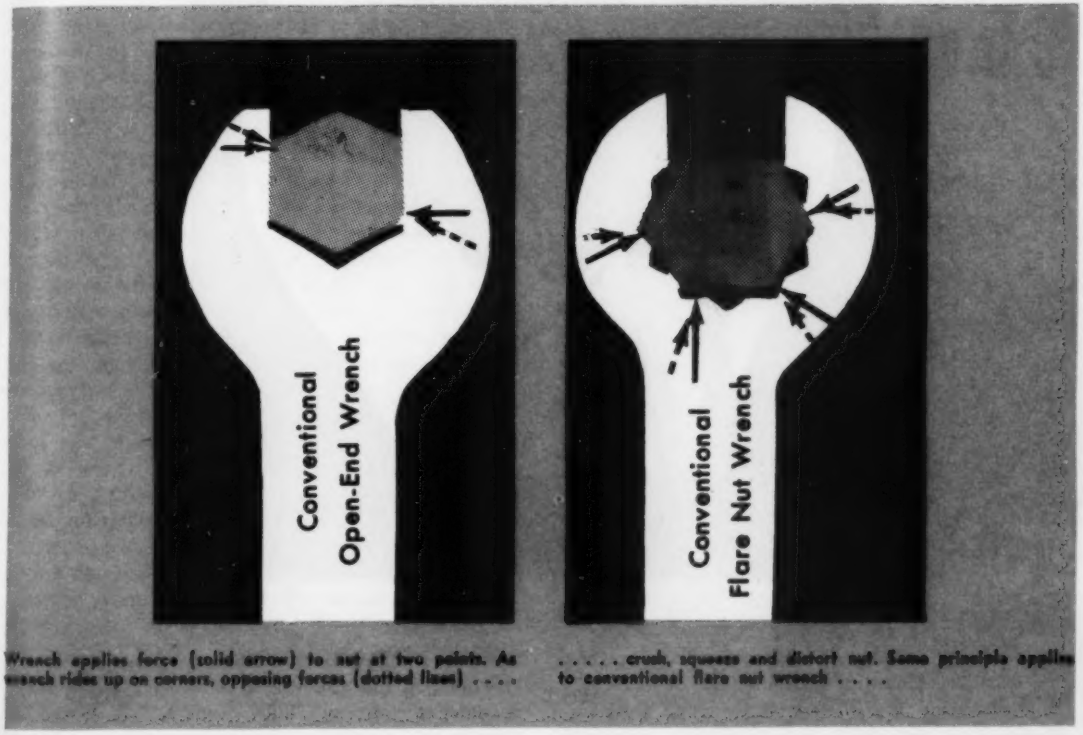
Doublers	Unbonding (See View A)	100 percent of area outside rib flange on box skin, max 25 percent of remaining area permitted, but repair as described in para 4-12 as soon as possible
	Scratches, Nicks, Dents, Corrosion Pits	0.005 max depth
	Unbonding Exceeds Limits	Repair as described in para 4-12
	Damage Exceeds Limits	Replace doubler
Trailing Edge	Scratches, Nicks (See View B)	0.003 max depth. Repair as described in para 4-13
	Ply Separation (See View B)	2.0 max length, extending no more than 0.50 from edge. Seal with MIL-S-22473
	Not Straight	Permitted for span of 3 successive boxes if the skins are not wrinkled
	Dents	0.25 max, 1.0 max length. Repair as described in para 4-13
	Cracks, Holes, Damage Exceeds Limits	Not permitted. Replace rotor blade
Trim Tab	Scratches, Nicks	0.005 max depth. Repair as described in para 4-13
	Damaged Corners (See View B)	Repair as described in para 4-13
	Distortion, Cracks, Unbonding, Damage Exceeds Limits	Not permitted. Replace rotor blade
Tip Cover	Scratches, Nicks, Corrosion Pits	0.010 max depth
	Cracks	Those from rivet holes to edge are permissible as is. 0.50 max length from rivet holes in any other directions: Remove tip cover, support firmly, drill 0.098 stop-hole, deburr
	Dents	0.125 max depth. Inspect for cracks with dye-penetrant
	Holes, Distortion; Damage Exceeds Limits	Not permitted. Replace tip cover

To ensure getting carried away, ensure proper blade inspections!

Tools for B

Light-weight, thin-walled tubing fittings in modern aircraft require special care to avoid distortion during connection and disconnection. Therefore, the selection and use of the best tool for the job is most vital in the man-tool-torque relationship and aircraft plumbing system integrity. Here's an insight on the tangential force tool concept.

rB-Nut Tightening



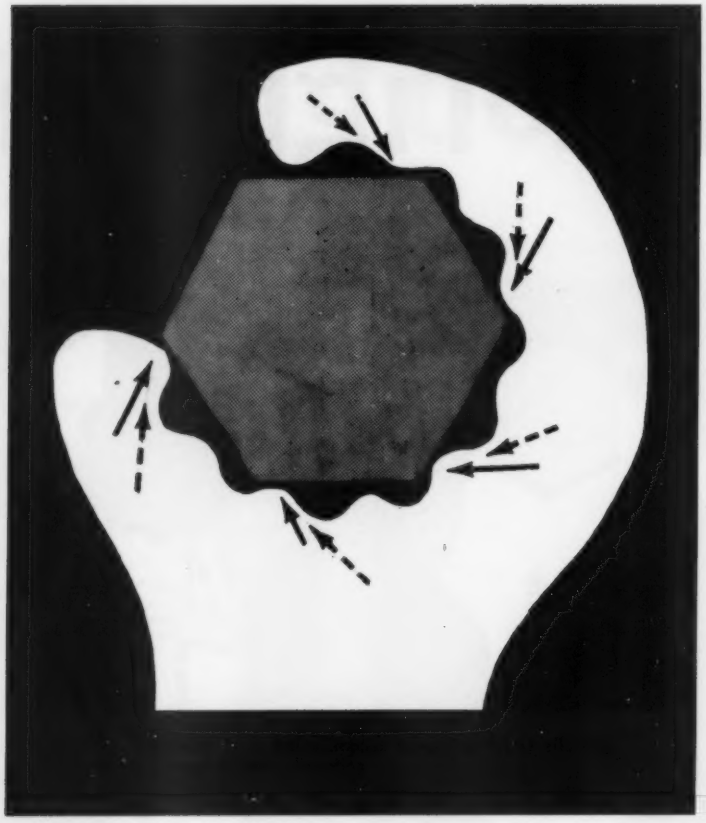
Wrench applies force (solid arrow) to nut at two points. As wrench rides up on corners, opposing forces (dotted lines) . . . .

. . . . . crush, squeeze and distort nut. Same principle applies to conventional flare nut wrench . . . .

Over the years one of our more common recurring maintenance errors—improper torquing of B-nuts on hydraulic, fuel, oil and pneumatic fittings—has continued to plague the mechanic. At least his workmanship, or the lack of it, winds up on the reports as the cause of the faulty performance in too many cases. Few, if any of the investigations ever blamed the tool, or the tool situation.

Come to think of it, the development of wrenches to do the job hasn't kept pace with the development of aircraft. Back in the days of Orville, the common open-end wrench or the adjustable (monkey) wrench used on machinery of that time were heavy, thick-walled and made from ordinary malleable steel. These were adapted for use on airplanes and did the job until World War I. Then, six-point box or open-end wrenches were developed and used until around WW II when 12-point wrenches came into use. Today, with sophisticated supersonic aircraft we're still using the same tools and we're still having the same problems.

The first innovation of consequence in wrenches is said to be the development of durable thin-walled wrenches which apply a tangential force to nut and bolt heads (see illustrations). When you casually eyeball one of these wrenches you can hardly detect the difference from the ordinary open-end and box wrenches. But users, including the mechanics at one of our major rework facilities, say these are the greatest aids to man since gunpowder. Their value



lies in the ability to tighten or loosen fittings without distortion of the nut and threads.

Nut distortion is the enemy of precise torquing because stress applied to only a couple of points causes metal flow in threads.

Abnormal thread friction and consequently false torque, results in less thread engagement than required to seal securely. This condition then shows up in the form of leaks and failures resulting in aborted missions, extra maintenance effort and many times in major mishaps costing us plenty.

The secret in B-nut tightening is application of tangential force. The new (Loc-Rite) wrenches have this capability because their design is such that the rounded lobes bear only on the hex flats and never touch the corners. Therefore, forces are tangent to the flats, as shown. In addition to providing forces beneficial to the nut, this type wrench, being independent of uniformly filled corners, will loosen or tighten hex nuts that are already badly damaged.

Since a great percentage of aircraft plumbing leaks are caused by three effects of distortion resulting from use of inadequate tools:

- Squeezing, forcing out of round,
- Binding, which produces false torque-tension,
- Galling, which roughens sealing surfaces,

the procurement and use of tools which can do the job without subjecting the hardware to such problems makes sense to us. Every aircrew deserves a mechanically sound aircraft. It follows that the mechanic should use only the best tools to do his job in making the aircraft meet these requirements.

Common-sense in an uncommon degree is what the world calls wisdom.

Samuel Taylor Coleridge (1772-1834)

Are Tools Lethal Weapons?

By Col. C. L. Carson, USAF

If you asked anyone if a crescent wrench is a lethal weapon, he would probably say, "I'd sure hate to get conked on the head with one!"

Murder stories are sprinkled with "blunt instruments" such as hammers, tire tools, wrenches, etc., attesting to the fact that if you are out to kill someone, almost anything handy will serve as a weapon.

In the aircraft maintenance business, tools can also become deadly weapons when the user is careless, unskilled, unsupervised or just plain lazy.

Let's use an example: Joe Fivelevel is installing a fuel control on a jet engine. He has done this little job many times and probably considers himself an expert at this sort of thing. Comes time in the process to torque the B-nut on a line. "Shucks!" says Joe. "I gotta go all the way back to the tool crib for a torque wrench and then by the shop to look up the torque value in the T. O. Guess I'll just slap this little ol' crescent on 'er and tighten 'er up good. I've got another job waitin' on me."

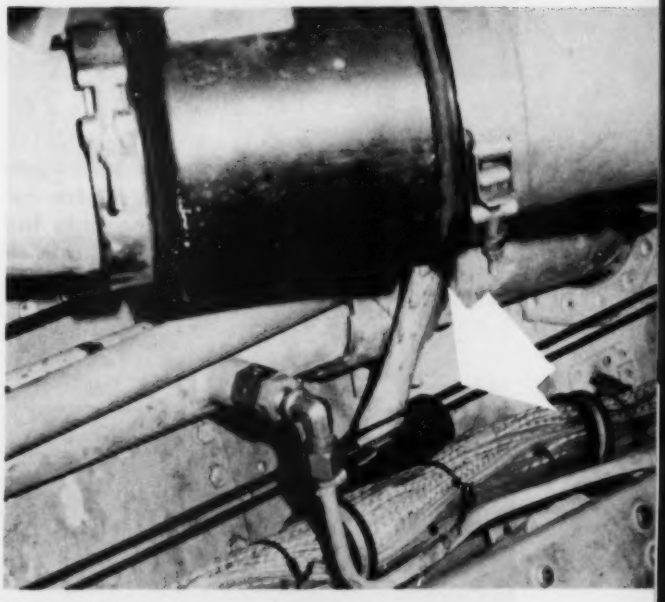
So Joe, using the crescent and what he considers to be an "educated arm," tightens the nut and signs off the work orders. He calls for a harassed supervisor to sign off the "Inspected By" block on the sheet and that's the end of it.

The supervisor is busy and doesn't inquire as to what torque value was used on the B-nut or whether a torque wrench was used. He knows ol' Joe is a capable guy, so he scribbles his John Henry in the form and moves on, blissfully unaware that good ol' Joe torqued the nut improperly and something's going to give, sooner or later.

When the crash siren wails a week or so later and the flight line gang sees an aircraft that has clobbered and burned off the end of the runway, the big sweat will start. The maintenance chief will lose sleep, wondering what the Accident Board will come up with. The line chief will wonder if anything in the impounded records is going to point to a maintenance goof.

When the report comes out, the worst fears are realized. "Primary Cause," reads the report, "B-nut worked loose causing a fuel line separation. Raw fuel exploded in the engine at the moment of rotation on takeoff roll." The report ends tragically, "Pilot was trapped in wreckage and fatally burned."

So now the maintenance chief, line chief and ol' Joe have a sad fact to face. You don't have to hit a man over the head with a crescent wrench to kill him with it.



A hammered topic—but it still happens! Hammer found in an F-8 could have:
1. Caused throttle control restriction . . .
2. Jammed aileron control . . .
3. Become a lethal weapon!

I've never heard of a man like ol' Joe being charged with negligent homicide and being sent to prison, but I wonder how many times he will look in the mirror, during the rest of his life, and say, "It was you, Stupid! You killed that pilot!"

Maybe we need to slap a label on all tool boxes reading, "This is a do-it-yourself killer kit unless used IAW tech orders." ◄

—Adapted from Fifth Air Force Safety News

FOD Kills Mission—Above: *Phantom* taxiing into position for night cat launch. Below: Seconds later camera catches dramatic disintegration of jet's innards spewing onto the flight deck. For the want of a clean deck, the sortie was killed, aircraft availability and many maintenance man-hours were lost, and the operating potential of a J79 cut short, reemphasizing that FOD prevention is *everybody's* business. ◄

MURPHY'S LAW*

MURPHY—SH-3A Control Rod

DURING a normal servo check, a ratcheting noise was heard when checking lateral movement of the cyclic. Upon investigation, it was found that the lateral control rod extending from the auxiliary hydraulic control unit was reversed at its after connection to the next control rod (see photo 1). This caused the rod to drag on the side of the "Broom Closet" (see photo 2). The control rod drag point showed sufficient wear to have been in that condition for a considerable length of time. There was no binding in the controls.

If the control rod had been mounted in this manner but rotated 180 degrees, AFT cyclic movement would have been limited due to the holding pin which projects from the rod at that point.

Maintenance personnel have been cautioned on this Murphy. See correct installation, picture 3.

—Contributed by LT N. R. Sparks, ASO, HS-2

* If an aircraft part can be installed incorrectly, someone will install it that way!

Letters

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request.

Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. 23511. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Stokes Litter

San Diego, Calif.—In the October issue, Headmouse section, PR2 R. T. Perkins inquired how to rig a Stokes litter with flotation gear. He had tried kapok and found that it did not provide enough flotation for the litter. Headmouse's answer stated that a fiberglass litter is being developed by the Army and will be evaluated by the Navy. We, here at San Diego, evaluated a prototype of the plastic model and found that it broke up and cracked with continued use. Possibly this discrepancy has been overcome by now.

We liked the strength of the galvanized Stokes litter and added ethafoam tubing around the upper two-thirds to lift the patient's head and keep his feet below water. Stability has been quite satisfactory. An additional head bumper was added as well as a chin strap. The helicopter lifting cables should go completely under the litter near the head and feet and meet at two eyes located high enough over the litter to provide stability while lifting. The patient's feet should be slightly lower than his head when being lifted by hoist.

The old saying that a picture is worth 1,000 words is certainly true in this case and several photos are enclosed as well as a piece of the ethafoam. Good luck in the business of saving lives.

LCDR EDWARD L. MURNANE, USCG

Ethafoam tubing was added to a galvanized Stokes litter so that the patient's head is lifted and his feet are below water level.

A head bumper and chin strap are additional safety measures.

Helicopter lift cables meet at two eyes high enough over the litter to provide stability while lifting. During lift a patient's feet are slightly lower than his head.

Rescue Basket

NAS Pensacola—In reference to the October 1967 issue of APPROACH and the problem of PR2 R. T. Perkins "trying to devise a way to attach and what to attach to a Stokes litter for flotation purposes," I am reminded that the Coast Guard's new Helicopter Rescue Basket PN 550-3-3, FSN 1670-R00-7970, is fabricated with SAE 4130 steel tube and sheet and that it is afforded buoyancy in the water by two flotation cylinders. The cylinders are resin-impregnated fiberglas shells filled with polyurethane foam.

The bail is a beam assembly of tubing and sheet fillet welded at all contact points. The beam thus formed is capable of supporting loads far beyond those anticipated in service. Access for complete interior preservation is provided by drilled passages incorporated during fabrication. Interior treatment is accomplished through two drain-and-fill fittings located at diametrically opposite points on the basket. The design of the basket eliminates sharp corners by incorporating large radii throughout. Thus, the potential for puncturing the skin of the aircraft during use is minimized.

Further information concerning the specifications for this improved model rescue basket may be obtained from the Commanding Officer, U. S. Coast Guard Aircraft Repair and Supply Center, Elizabeth City, N. C., 27909.

CDR P. A. HOGUE, USCG
SENIOR COAST GUARD AVIATOR
NAVAL AIR BASIC TRAINING COMMAND

Pen Gun Line Knots

Parkesburg, Pa.—This writer could not help but read the letter from PR1 J. R. Kelly, Fighter Squadron 103, in "Headmouse," October 1967. I might add that we agree with him. I do hasten, however, to remind both Petty Officer Kelly and yourself that the kits —including the knots—are manufactured in accordance with strict Navy drawings and specifications. In other words, we couldn't change the knots if we wanted to.

Additionally, as you may know, there is a "first cousin" to the Mk 79 Mod 0 signal flare kit called "Signal Kit, Personnel, Distress, A/P 25S-1" to MIL S-38409A which has a tape bandolier, thus positively preventing the loss of any of the flare cartridges. This kit is the one commonly used by the Air Force.

AUSTIN M. WORTLEY, JR.
PRESIDENT, PENGUIN ASSOCIATES, INC.

• As a word of explanation for those who did not see PR1 Kelly's

Dieting is a battle that you win only if you lose.

Anon.

letter to **Headmouse in the October issue, he expressed the opinion that the knots tied in the lanyard connecting the pen gun to the flares are insufficient and can come undone in a survival situation. He recommended use of a bowline knot.**

Alert Is the Word

NAS Pensacola—Although the alertness of the aircrewman is certainly noteworthy ("Jump Seat View" October issue), a comment by the editors mentioning the hazards of unfamiliar hands in the cockpit should be in order.

Only the crewmember assigned the responsibility to enact emergency procedures should do so or the purpose of NATOPS seems to be defeated. For example, turning on boost pumps when there is a drop in fuel pressure is *not* the procedure prescribed by NATOPS.

LCDR H. G. KUNKLER
LT D. S. LAUER

• Right you are, gentlemen—you made the point so we credit you with an alert editorial assist. Thank you.

Ideas For Improvements

NAAS Kingsville—Here's an idea which I thought could be used appropriately in APPROACH.

The idea is a section for letter contributions to be sent in under the heading of, "I'd Like To See Them Make" or, "Better Jury-Rigs" or something of this nature. I am sure that the pilots who fly the various aircraft have ideas for small safety items for their specific aircraft or aviation in general. I feel that if this section were available to the pilot and maintenance personnel in an informal way the aircraft and aviation safety would benefit appreciably if the ideas were brought to the attention of the appropriate DOD personnel. After all, who knows better than the operator what items are needed or which are inherently dangerous.

It could be under the "Letters to the Editor" column but I thought more emphasis could be placed on it in a special continuing section.

An example that I can think of right now is in connection with the rear view glass mirrors that are in the F-9 and most fighter aircraft. These break easily when any torque is applied to the aircraft and when they do glass chips pop out which could easily go into the eyes of the pilot. I'd like to see them use a high quality chrome mirror. It would cost less and be a much safer item. It doesn't shatter or break at all and would not need to be replaced.

LT T. A. MYERS
ASO, VT-23

• We're happy to feature good ideas such as this in our Letters section any time we receive them. Our individual aircraft analysts also welcome suggestions from the fleet. Whatever answers or improvements they can offer will appear in *Crossfeed*, often much sooner than they could be published here.

On the question of rear-view mirrors in the F-9, further investigation indicated that failures of the type mentioned were due more to misuse of the mirror (as a hand grip or place to hang small items) rather than any inherent structural weakness.

Velcro Fix

FPO New York—During our last deployment, the two fighter squadrons in CVW-9 passed on to us an outstanding method for attaching the aviator's survival light to the helmet during a survival situation. They cemented pieces of velcro tape onto the light and the helmet. After determining that the holding power of the velcro was not degraded during long periods in salt water, RVAH-7 adopted this method.

Recently *Aircrew System Change 105* was received which provides for the survival light to be attached to the helmet by using a stainless steel bracket and clip. While evaluating this change, it was found that the helmet mounting bracket can easily scratch the canopy and that it occasionally catches on the face curtain handle. Also, it is believed that during a cold wet, dark survival situation while wearing gloves, the pilot or crewman could attach the light to the helmet much more easily with velcro than with the stainless steel clip.

For the above reasons, most crew members prefer to continue using the velcro "fix" rather than incorporating *Aircrew System Change 105.*

LT J. K. SUTOR
ASO, RVAH-7

• *Air Crew Systems Change 105, Installation of Survival Lights on APH-5 and-6 Helmets,* was cancelled just before your letter was received. The Naval Air Development Center, Johnsville, is presently evaluating the use of velcro to hold the strobe light on the helmet.

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Next Month

A Saga of Retractable Landing Gear

and other items of interest to the Naval Aviator.

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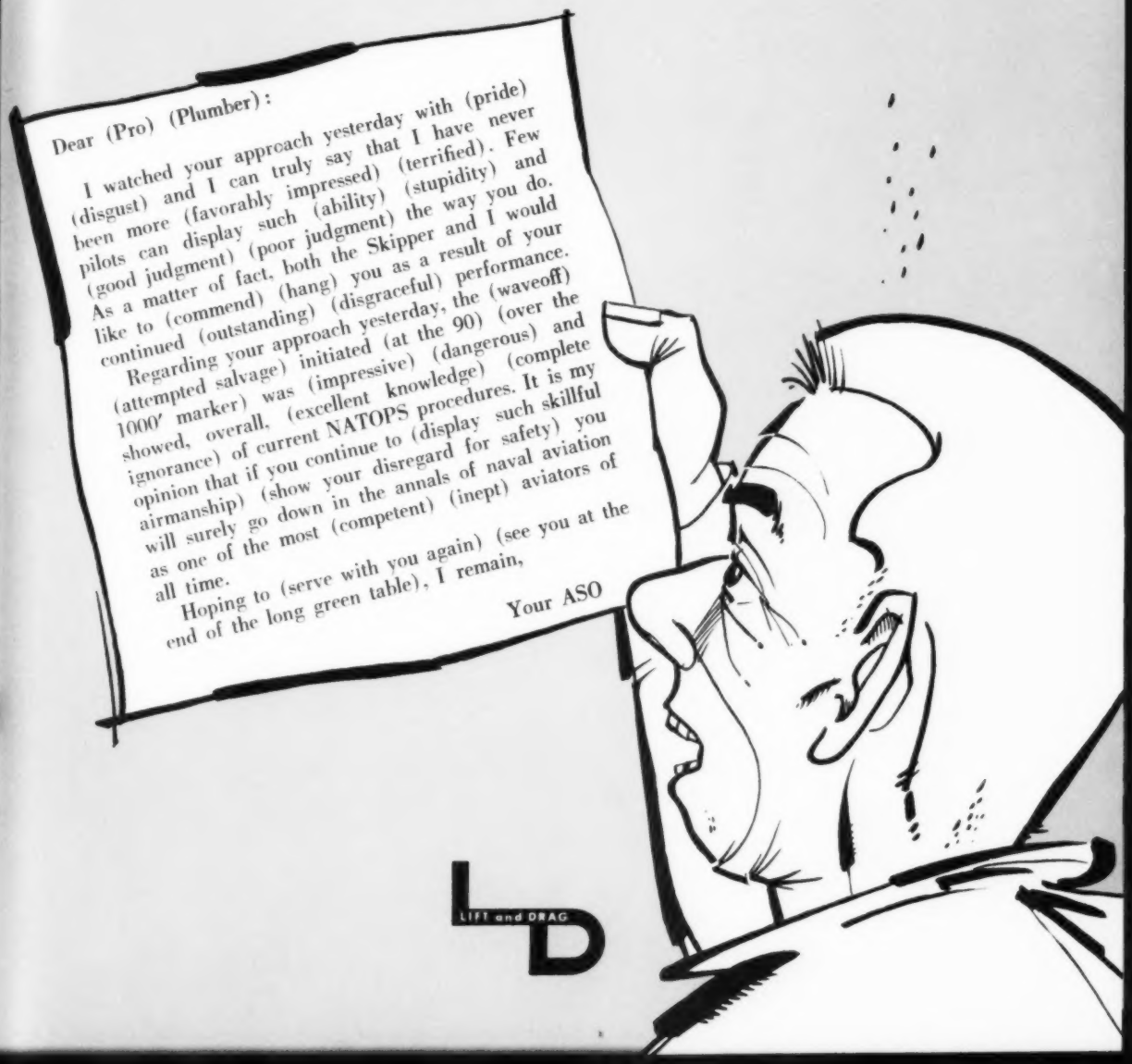
LETTER FROM YOUR ASO

Are you a hero or a goat?

Sometimes only a fine line separates the two.

In any case, you may receive a letter like this

some day, with the line drawn where it is most appropriate.

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